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Cover photo:
Woodbridge Winery bottling line, Woodbridge, CA. Photo by Fred Lyon.

"To stimulate continuing improvement in the wine industry."

New grapevine ID service launched at UC Davis

Grapegrowers, wineries, nursery managers and industry representatives now have access to a reliable DNA profiling service for identification and characterization of grapevines at the University of California, Davis.

The university's Department of Viticulture & Enology has created the most extensive database of grape DNA profiles in the world. In June, 2003, UC Davis began offering DNA profiling for grapevine identification to the public, providing access to this highly specialized type of testing.

The service identifies grapevine cultivars by comparing the DNA profile of a sample to a database that contains over 600 profiles of the major winegrape, tablegrape, raisin, and rootstock varieties grown in California, along with most of the grape varieties grown in other major viticultural regions. This database makes use of microsatellite markers, which are specially selected target sequences of DNA. These markers produce a unique fingerprint when they are tested with each variety. By comparing these fingerprints, highly accurate identification is possible.

The service is offered through the Foundation Plant Service (FPS), formerly known as Foundation Plant Materials Service, a department in the College of Agricultural and Environmental Sciences at UC Davis. FPS has a long history of cooperative projects with the Department of Viticulture & Enology.

Much of the technology and the extensive database of grape DNA profiles was developed in the laboratory of Dr. Carole Meredith, emeritus professor in the UCD Department of Viticulture & Enology.

In 1996, when the database consisted of only about 50 microsatellite DNA profiles, Meredith and (then graduate student) Dr. John Bowers realized that DNA profiles were useful for studying relationships between cultivars, and in identifying varieties. Bowers developed a method to search the database for closely-related varieties, which led to the discovery that Sauvignon Blanc and Cabernet Franc are the parents of Cabernet Sauvignon. The profiles of several hundred more varieties were added to the database including a large number from the French national collection of the University of Montpellier.

Gerald Dangl, a staff researcher in the Department of Viticulture & Enology, manages the new ID service. He has years of experience in grape DNA typing. "People find that they have a vine, and they don't know what it is," says Dangl. "Or they have vines that are supposed to be a particular cultivar, and they suspect that they might actually be something else altogether. Often we will merely be confirming vine identity."

A sample of a plant in question is typed at eight microsatellite markers, and the resulting DNA profile is compared with the database. For grapevines, eight markers are a sufficient number to uniquely identify any cultivar to an extremely high degree of confidence. The grape genetics research community considers six markers to be sufficient to distinguish all existing cultivars.

A second service is offered for grape breeders and/or owners of patented or proprietary plant cultivars who wish to use DNA profiling to characterize and protect their new cultivars.

The best type of sample is collected from tiny leaves on actively growing shoot tips. Tissues, including older leaves, roots, fruit and dormant cuttings, can be used as well.

The typical leaf sample is dried chemically to preserve the DNA. The dried samples are very stable. Drying eliminates the need for refrigerated storage and shipping, and since the samples are dried, dead tissue, they are not subject to federal quarantine regulations governing the importation of living grapevine tissue. Materials and instructions for collecting samples will be provided as part of the service.

Results are returned in six to seven weeks, unless a "rush option" ($40 extra per sample) is specified. Rush orders are returned in three to four weeks.

COSTS:

Service 1: Genetic (DNA) identification of plant cultivars: $225 per sample for lots of six or more per submission; $300 per sample for lot sizes under six.

Service 2: Genetic (DNA) profiling of plant cultivars: $1,000 per cultivar. ■

For more information, contact Gerald Dangl, gsdangl@ucdavis.edu, 530/752-7540.

Sonoma County Viticulture Award of Excellence

Seeking a good glass of wine

BY Andrew Hidas

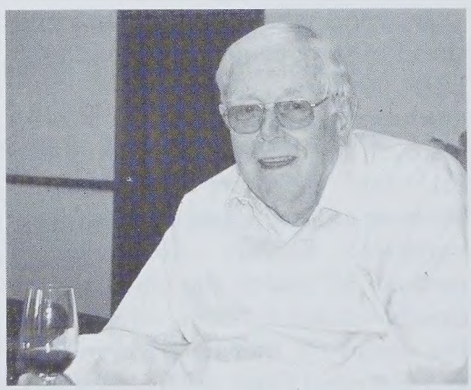
Listen to anyone who has progressed to a certain mature stage of their career path, and you'll tend to hear some variation of this common, slightly whimsical insight: "It's amazing to finally know how much I don't know." Sixty-nine year old Dale Goode has managed to turn that lamentation into a celebration nearly every day of his 45-year career in the wine industry.

Goode is a longtime Alexander Valley (Sonoma Co., CA) grapegrower and part-owner of Murphy-Goode Vineyards and Murphy-Goode Winery. He was feted in May with the Sonoma County Grape Growers Association's annual "Viticulture Award of Excellence."

Though he is widely hailed as a fount of knowledge who helped usher in the modern wine era in Sonoma County, he projects as much the young boy's endless fascination with science phenomena as he does the wizened old statesman's penchant for grapegrowing.

"I think that's the neat thing about the grape industry — it's been around for 5,000 years but we still don't have a handle on the best way to do it," says Goode. "Grapegrowing involves an unlimited combination of variables, many of which you have no control over. The challenge is in manipulating these variables to come up with the thing we're all ultimately striving for: a good glass of wine."

That focus on the end product, framed with simple elegance in his oft-repeated phrase "a good glass of wine," led Goode to tilt at more than a few windmills during his career. However well-deserved Sonoma County's airs of winemaking sophistication are today, the reality is that Goode took a wealth of progressive grapegrowing experience with him there in 1965 from Delano, some 200 miles south and a stone's throw from his boyhood home in Bakersfield. He had been vineyard manager for California Grape Products there before accepting the same position with Hoot Owl Vineyards and Alexander Valley Vineyards under owners Russ Green and Harry Wetzel.



"5,000 years of practice has taught us how much we still don't know about winemaking," says Dale Goode.

The skills Goode brought with him included trellising, cordon pruning, and irrigation, all of which were considered not applicable or simply wrong-headed by Sonoma farmers at the time. When Goode ignored that conventional wisdom and went on to earn plaudits for his high quality grapes, it helped set Sonoma County grapegrowing on a dramatically different course from which it is pleased to have never recovered.

"There was no reason why those techniques wouldn't work in Sonoma County," Goode muses. "There was talk of the climate not being right for irrigation, and people insisted that 'you can't grow grapes on wires,' but we just broke all the rules and never looked back."

Goode's experience with cordon pruning in the Central Valley showed him it could achieve superior ripeness and better balance in the vines, no matter the temperature differences between there and Sonoma County. Virtually all Sonoma grapes were head-pruned at the time, though cane pruning was beginning to establish itself with new varieties that were just coming into favor.

"All the fruiting buds are in the same plane on the cordon, so the vigor is spread out and there's no big variance in ripening," Goode observes. "With the vines spread out, it's also easier to pull leaves and mechanically harvest, and you can mechanically preprune and then come back to trim up the spurs by hand. There are so many labor-saving tools with cordon pruning that you don't have with head pruning."

Goode graduated from UC Davis in 1958 with a degree in agriculture and a minor in viticulture before going to Delano. "I didn't know one grape from another when I went to Davis," he recalls. "Most of my family was in the dairy and cattle business, so we drank milk. When my parents did drink alcohol, it was cocktails."

Nevertheless, with small classes and thus plentiful interaction with his viticulture professors, "Something just clicked," he says. "I knew this would be my life."

Most of the wine made from his Delano grapes — chiefly Carignane, Petite Sirah, Ferasago, Muscat and Palomino — was shipped by railroad to Chicago, New York, and other eastern cities, where it was bottled and sold to the wine cognoscenti of the day. "We got $27.50 per ton for the grapes, and they became very drinkable wine," he says. "Even by today's standards."

When he arrived in Sonoma County, he found far more lovely scenery but a wine market not funda-

mentally different from what he had just left. "Robert Young had just planted the county's first Cabernet Sauvignon in 1963, and, to my knowledge, we were the first to plant Merlot here two years later. Growers hadn't wanted to plant what were considered grapes for 'fine wine' because yields were lower."

Yield concerns were intensified when Robert Young broke with a century of tradition and began planting in rows of 8 feet X 12 feet rather than 8 X 8 or 7 X 7. Goode was right behind him. "The university (Davis) felt we would get the same tonnage over time," Goode remembers, "and the short-term loss would be offset by it being much easier to get equipment between rows. The extra space also lent itself to wire trellising."

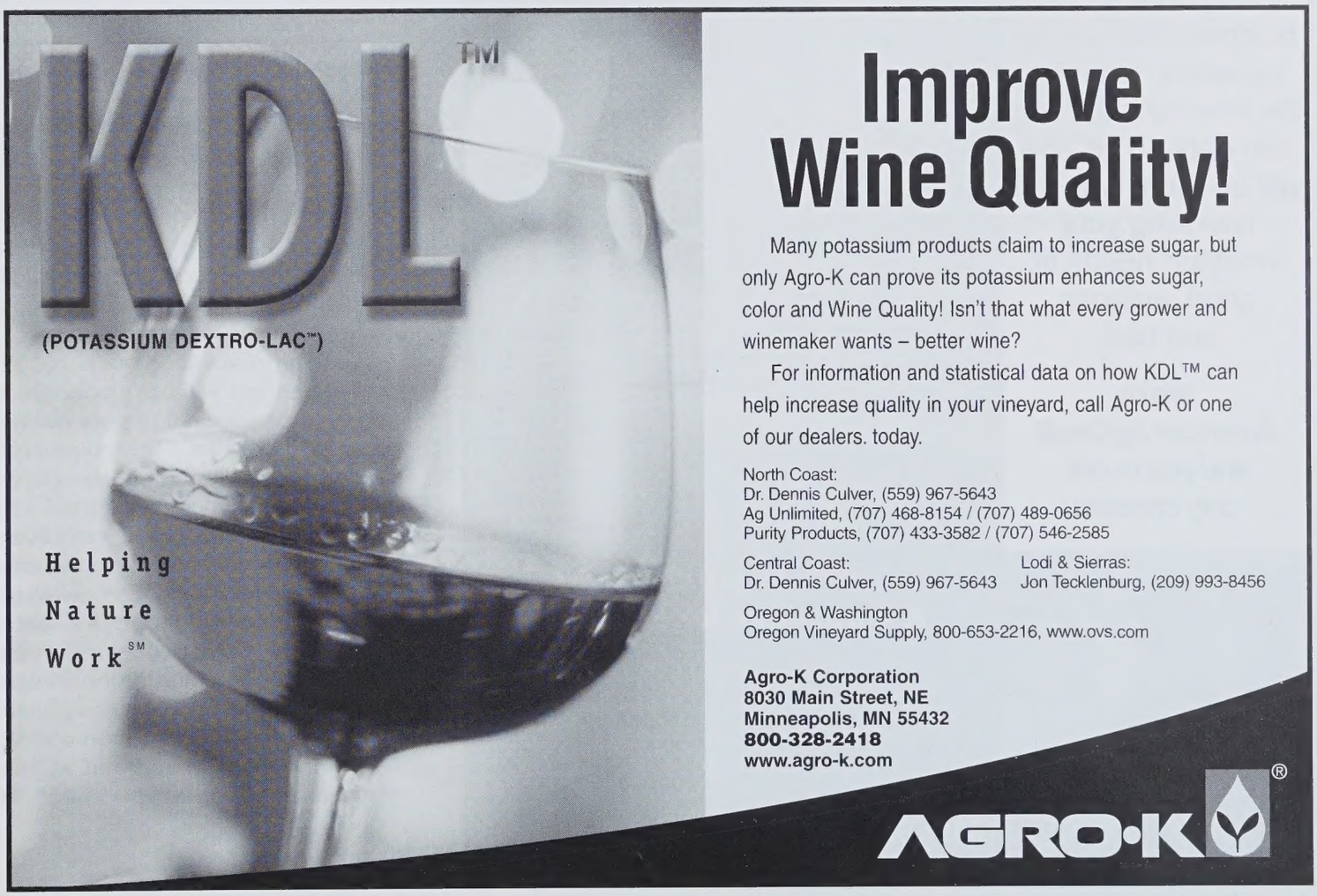
Subsequent research revealed that 9 X 6 spacing allowed for significantly more vines per acre — a whopping 806 rather than the 454 in 8 X 12 spacing. "The more root systems, the better quality grapes, even though you get lower yield per vine," Goode says. "I understand that Ferrari Carano is now planting 2,000 vines per acre. Whether that makes for better grapes, we'll see. That's the great thing about the wine industry."

Goode remembers delivering his first Cabernet Sauvignon grapes to Pedroncelli, Seghesio, and a few others for $200 per ton in 1967. "It was all beginning to change then, as we began planting more fine varietals — Cab, Pinot Noir, Merlot, Gewurtz, and Johannisberg Riesling. There were still only 10,000 acres of winegrapes in Sonoma County at the time. Healdsburg was known as 'the prune capital of the world.'"

Goode was still managing Hoot Owl and Alexander Valley Vineyards in 1980 when he teamed up with Tim Murphy to develop the last large-scale block of Alexander Valley prunes that had not been converted to grapes. (Murphy had made his own initial 20-acre vineyard purchase in Alexander Valley in 1967 and subsequently grew his Murphy Ranch estate to nearly 250 acres.)

Working on a 40-year lease of the property, Murphy-Goode Vineyards was content to grow and sell grapes to various wineries until 1985, when a sudden grape surplus gave birth to Murphy-Goode Winery, a joint venture between the two vineyard partners and wine marketing executive Dave Ready Sr.

"Starting Murphy-Goode Winery allowed us to go beyond just growing grapes," Goode says. "We realized that as much satisfaction as there had been in delivering good quality grapes to others, we'd been engaging in only half the process ourselves. Now the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cycle was complete. We could grow the grapes, make wine from them, and then at the end of the day, sit down with friends and enjoy what we'd made. Or, we had no one to blame but ourselves if we couldn't turn out a good glass of wine."

Murphy-Goode has since earned a secure place among critics and consumers for a line of estate and Sonoma County wines that includes Fumé Blanc, Chardonnay, Cabernet Sauvignon, Merlot, Zinfandel, Pinot Noir, and others. (The sole non-Sonoma exception is a Sauvignon Blanc sourced in nearby Lake County.) All Murphy-Goode Vineyard grapes go to the winery, as do most Murphy Ranch grapes. The winery produces 160,000 cases per year, with no plans for exceeding that amount, according to Goode.

"One person can stick his nose into only so many barrels," he says. "I've never seen anyone — with the possible exception of Beringer — expand to a million or two million cases and maintain quality."

Goode's activity has been shifting steadily over the years to more administrative functions as age and the after-effects of a 1976 accident have left him, in his words, "leaving more of the hard work to the younger guys." He had been a founder of the Alexander Valley Volunteer Fire Department, and was driving a fire truck through a severe windstorm in 1976, when a tree blew over and crushed the truck cab, breaking Goode's back and putting him in a wheelchair.

"Since my injury, I haven't been able to drive a tractor or that sort of thing," he says, "but my heart will always be in grapegrowing. That's the part of the business I understand the best."

He still meets daily in a consulting capacity with Tim Murphy's son Jim, who now handles the bulk of the growing chores along with his brothers Dennis and TJ. Winemaking is handled by Ready's son David Jr., with younger brother Adam as cellarmaster.

"You can make great wine out of good grapes, but you can't make great or even good wine out of poor quality grapes," Goode states. "The end product is still under the control of the grapegrower — that's where it all starts."

As for the future, Goode can't even begin to grasp the concept of retirement. "It's never been work!" he exclaims, throwing his arms in the air in a seemingly fruitless attempt to take in the vast good fortune of a life spent around grapes and wine. "It's like doing your hobby and being able to make money at it. And if it doesn't work out as you want it to, there's always next year." ■

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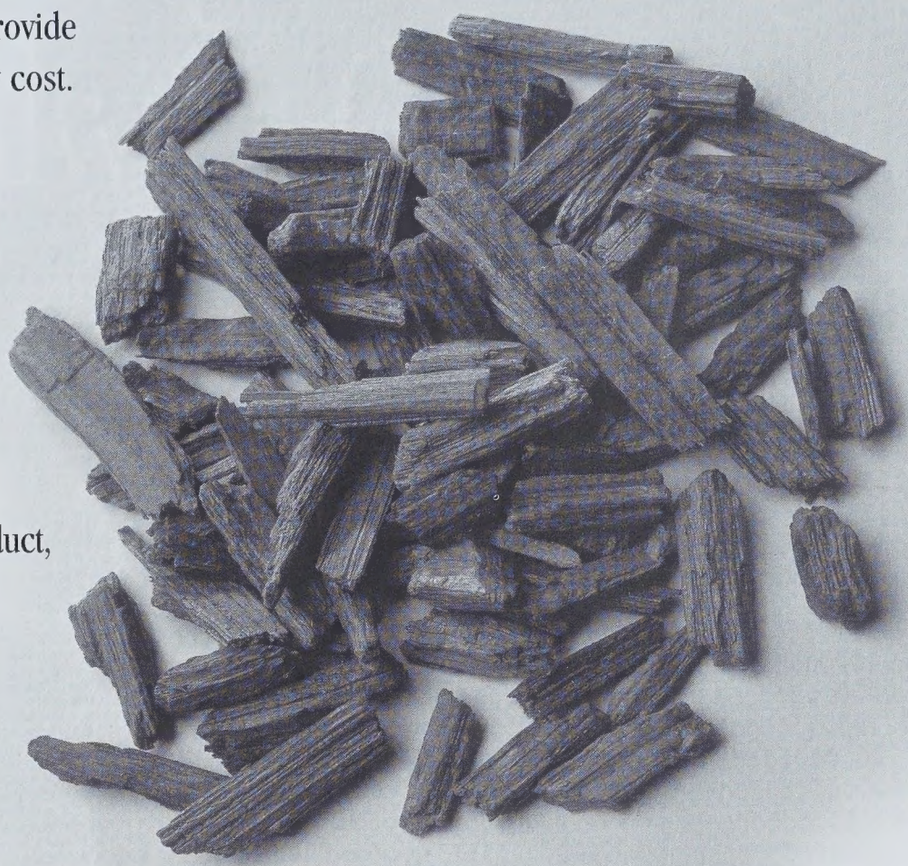

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AVF-FUNDED RESEARCH

Zinfandel Heritage Vineyard Update

BY James A. Wolpert,
Michael M. Anderson[1]
Department of Viticulture & Enology
University of California, Davis

Zinfandel is a grape variety of noble stature. In California, we are fortunate that it has no historical stylistic context elsewhere in the world that restricts our winemakers' creativity.

Few New World wine regions have had the opportunity to create a great new wine. With other varieties, we have constantly compared our efforts to European standards. Zinfandel gives us an unparalleled opportunity to set our own standards for unique world-class wines.

However, some winemakers have commented — and even complained — for many years that the Zinfandel clones offered through the University of California's Foundation Plant Service (FPS) were not high-quality selections. In short, the clones were disliked because they had large, tight clusters and large berries, leading to bunch rot at relatively low ripeness. The resultant wines were criticized for having low intensity of varietal character.

Before Zinfandel's country of origin was discovered, it was not possible to improve the variety by importing better clones, as is the case for European varieties. However, the discovery that Croatia is the country of origin turned out to be of little help, because the variety is not widely planted there, so the amount of variability Croatian plant material can contribute would not be expected to be high.

Fortunately, however, many old Zinfandel vineyards in California survived Prohibition and often dated back to the late 1890s. The reputation of old Zinfandel vineyards had been highlighted by winemakers, especially since the middle and late 1980s.

Armed with these demonstrations of quality "in the bottle" throughout California, and with the regional knowledge of UC farm advisors and local vineyard managers, a concerted effort was made to improve the UC Davis Zinfandel selections in the early 1990s.

Collecting field selections

Zinfandel selections were collected from throughout California to increase the possibility of finding selections that distinguish themselves. Collections were made from Sonoma, Napa, Mendocino, Lake, Contra Costa, Alameda, Santa Clara, San Luis Obispo, San Joaquin, Amador, El Dorado, and Calaveras counties, and the Cucamonga region of southern California.

Selections were made from vineyards at least 60 years old and older, because vines of this age appeared free of virus (visual "red leaf") symptoms. Attention was paid to finding vines with small berries and no disease symptoms. In addition to preserving these selections as a historical legacy, our goal was to choose from among them selections for distribution that will improve the quality of Zinfandel wines.

Planting the vineyard

The Zinfandel Heritage Vineyard, located in the Oakville Experimental Vineyard (Napa Valley) currently consists of 90 selections. Phase I, budded in 1995/96, consists of 63 selections and includes certified selections of Zinfandel (FPS 1A, 2 and 3) as well as three selections of Primitivo (FPS 3, 5, and 6).

In 1999, Phase II was added to the vineyard with an additional 27 selections. Dr. Carole Meredith and her associate Gerald Dangl confirmed through DNA analysis that all the selections in Phases I and II were indeed Zinfandel. The vineyard is planted at 9-ft x 8-ft spacing (row x vine) on a Gravelly Bale Loam. St. George was used as the rootstock, and the vines are head-trained and spur-pruned. Selections in the vineyard consist of seven-vine experimental units, without replication.

Planning for this vineyard was done with a strong appreciation that this was both a repository of plant material and a collection of historic material. Therefore, the vineyard was planted as traditionally as possible. The use of St. George rootstock, nearly square spacing and head-trained, spur-pruned vines supported only by split redwood

[1] The assistance of UC Farm Advisors Rhonda Smith (Sonoma), Donna Hirschfelt (Amador and El Dorado), Ed Weber (Napa), Glenn McGourty (Mendocino), Paul Verdegaal (San Joaquin), Jack Foott (formerly, San Luis Obispo) is gratefully acknowledged. The cooperation of UC emeritus viticulturist Amand Kasimatis, Ridge Vineyards viticulturist David Gates, and the department's Oakville Vineyard manager Jason Benz, is also greatly appreciated.

The Zinfandel Heritage Vineyard is a collaboration between the Zinfandel Advocates and Producers and the American Vineyard Foundation. The authors are indebted to ZAP's board of directors, and in particular, to its research committee, and its chair Joel Peterson, for their outstanding support. We thank the American Vineyard Foundation through which this research was funded.

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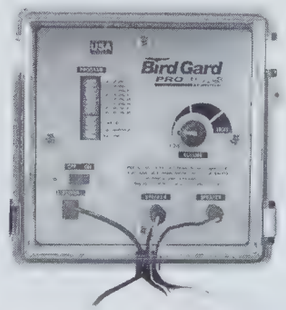

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Table I: Zinfandel Heritage Vineyard (Phase I)
1998–2002 Harvest Data (except as noted)

	1999 - 2002 Yield (kg/vine^{-1})	1999 - 2002 Clusters Per Vine	Cluster Weight (g)	1998 - 2001 Pruning Weight (kg/vine^{-1})	1999 - 2001 Yield Pruning Weight	Berry Weight (g/berry^{-1})	Berries per Cluster	Soluble Solids (° Brix)	pH	TA (g/l^{-1})
Entire Vineyard										
mean*	5.0	21	254	0.9	5.9	1.8	142	24.2	3.26	7.2
Std dev	0.9	2	35	0.2	1.2	0.2	17	0.6	0.05	0.5
High	7.7	25	336	1.5	11.0	2.2	183	26.3	3.41	8.8
Low	3.5	18	170	0.5	2.9	1.4	105	23.2	3.18	6.0
Primitivo Selections										
FPS 03	4.2	24	190	1.2	4.1	1.8	109	26.3	3.26	7.5
FPS 05	3.8	23	170	0.7	6.2	1.4	122	25.9	3.41	6.5
FPS 06	4.1	24	181	1.0	4.9	1.7	105	26.1	3.32	7.2
UCD Selections										
FPS 01A	4.9	19	274	0.9	6.2	1.8	153	23.7	3.24	6.9
FPS 02	4.0	20	218	0.8	5.6	1.8	122	23.9	3.22	7.2
FPS 03	3.9	19	229	0.8	6.0	1.8	128	23.2	3.28	6.7

*n=61

stakes is a design used widely 100 years ago. One concession to modern viticulture was installation of a subsurface drip irrigation system.

Virus status

No evaluation of the Heritage selections can be done without knowing the status of each. Often people gather selections together and take data, not realizing that the selections differ in viral status, so it is impossible to know if the demonstrated differences are due to clone or virus. The goal here was to avoid that mistake.

Relying on visual inspections, every effort was made to select vines that were free of virus. However, tests would be needed to confirm the viral status of the selections. All selections were tested for grapevine fanleaf virus (GFLV) prior to budding.

Polymerase chain reaction (PCR) detection of virus in grapevines, completed in 1999, is now felt to be more reliable than traditional woody indexing. From this point forward, PCR will be used as the definitive virus test for this project. Of the viruses detected in plant material with use of PCR, grapevine leafroll (GLR) was by far the most common, with 46% of the selections infected with one or more of the GLR strains (data not shown).

Other detected viruses were generally found in combination with a GLR strain. Only one selection that was free of GLR was found to have one of the other viruses. The high number of selections testing positive for GLR was not anticipated, reminding us once again that the lack of red leaves in fall is far from assuring a negative virus status.

Viticultural data

In 1998, we began viticultural evaluations of the selections in Phase I. These measurements are taken at harvest and include Brix, pH, TA, berry weight, yield per vine, cluster weight, number of clusters, and pruning weight per vine. Collection of yield-per-vine and clusters-per-vine data began in 1999.

Table I reports mean data inclusive of all years. Yield, measured as the mean of three vines per selection,

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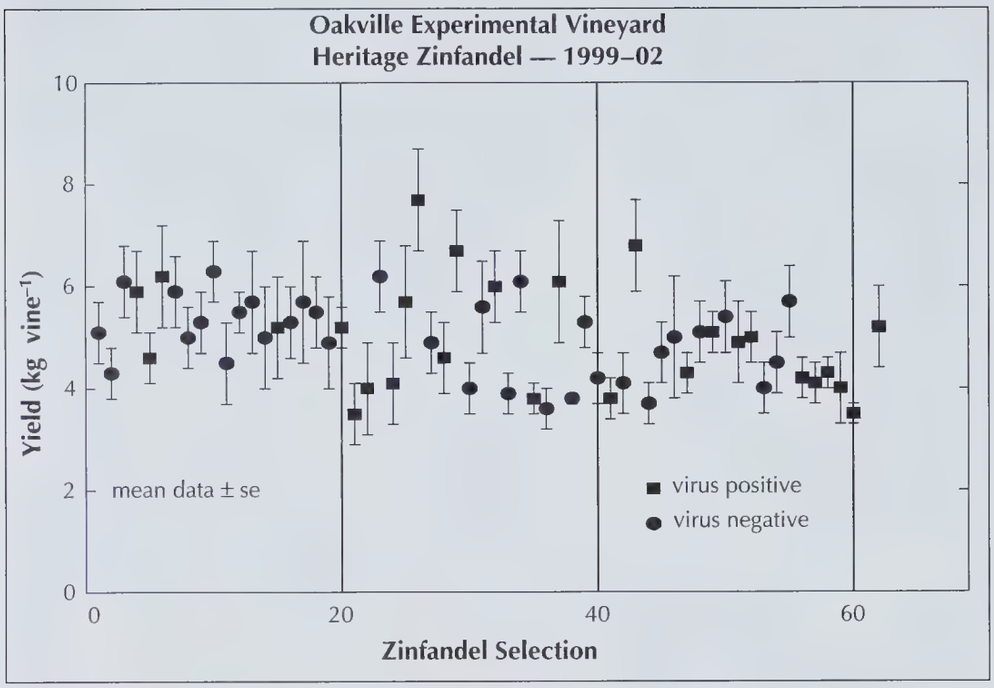
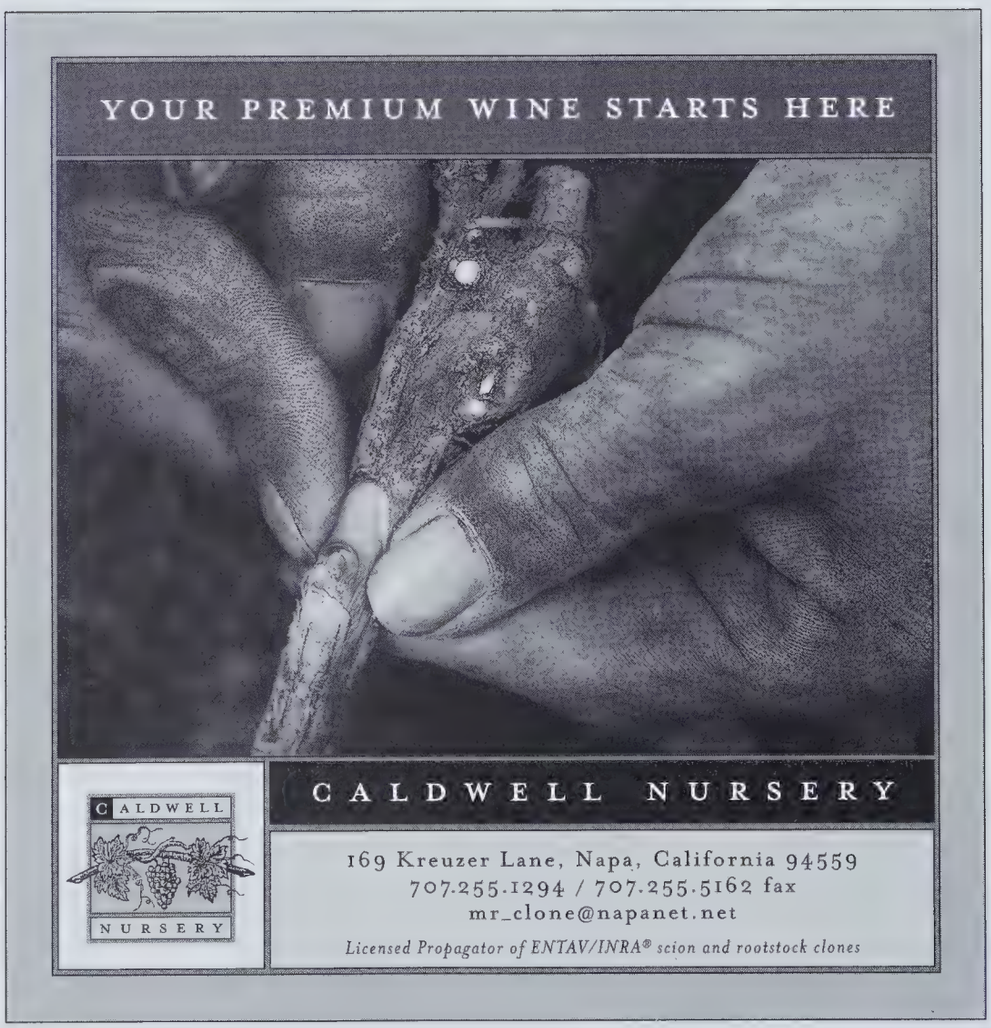


Figure I. Zinfandel Heritage Vineyard — mean yield 1999–2002. Data are ± standard error of the mean.



nearly doubled from a low of 3.5 kg to a high of 7.7 kg per vine. Mean yield was 5.0 kg per vine. Brix values ranged from a high of 26.3° to a low of 23.2° with the mean of 24.2°.

Average cluster weights varied almost two-fold, from 170 g to 336 g, a variation resulting from a combination of both the number of berries per cluster and berry weight. In order for a selection to be given advanced consideration, vines must perform uniquely and consistently over time relative to other selections.

The Primitivo selections have their origin in Italy and therefore may represent a line of Zinfandel different from those we collected in California. When compared to the Heritage Vineyard selections as a whole, several general observations can be made. Primitivo selections (Table I) all had values of yield, cluster weight, berry weight, and berries per cluster that were equal to or lower than the mean for all selections. Primitivo FPS 05 had both the lightest clusters and the smallest berries in the entire vineyard.

Additionally, the Primitivo selections had values for clusters per vine and soluble solids that were above the vineyard mean. At this point, the Primitivo selections, despite having more clusters per vine, seem to have lighter yields resulting from smaller berries and fewer berries per cluster that ripen earlier than most of the other selections in the Heritage Vineyard.

The FPS Zinfandel selections were singled out to investigate whether their reputation as large- berried, large-clustered, high-yielding selections was justified. The research showed that on no parameter did these selections set the high or low value for the vineyard. Nor did they fall outside the range set when looking at the mean ± one standard deviation. In general, we can say that up to this point, there is no data that distinguishes them from the Heritage selections.

Average yield data show a clustering between 4 and 6 kg per vine (Figure I). However, it is interesting to note that the data for some selections are quite variable, as seen by the length of the error bars, for exam-

ple, on selections 25, 37, and 46. This means that the yield is not consistent from year to year. Virus status is identified with different symbols in the figure, and there is no correlation of virus status with either yield or variability of the data.

New replicated vineyard

As research progressed, we came to believe we would not learn all we wanted to about the Heritage selections without a fully replicated trial. The advantages of replication appeared to be two-fold. First, we would have statistically valid comparisons, which would increase our confidence when we eventually make recommendations. Second, we would have much more fruit for winemaking trials.

One problem in our planning for a replicated vineyard was that the large number of selections made a large vineyard impossible. So we proceeded on a modified scale.

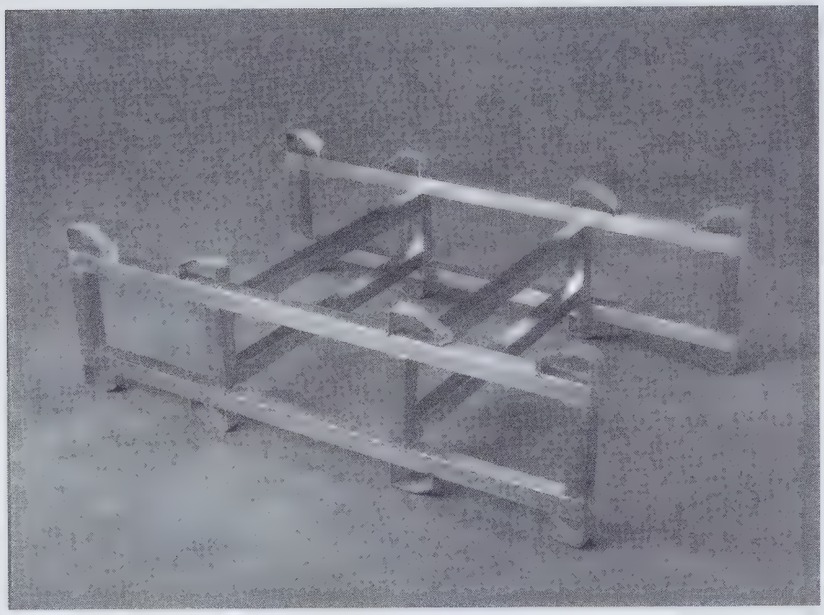
In 2001, a new replicated vineyard was planted. Deciding what selections to include required constructing a logical scheme. Within the Heritage Vineyard, there are multiple selections made from the same vineyard, and some of the selections have been found to contain virus. Our scheme employed these facts. Using the criteria of virus-free and unique vineyards origin, the number of selections was reduced from 61 to 20. In the case of vineyards with multiple clean selections, one selection was arbitrarily chosen unless wine had been made from one of the choices previously.

The new vineyard, like the original Heritage Vineyard, is located in the Oakville Experimental Vineyard's "Old Federal" vineyard. It consists of five replications of 18 vines occupying two acres. Once again, St. George rootstock was used. The vines are planted at a spacing of 6 x 8 and will be head-trained and spur-pruned.

It is anticipated that this vineyard will produce 450 kg (1,000 lbs) of fruit per selection, and that this will be sufficient to produce more than one barrel of wine per selection.

The rootstock was planted in 2001 and was budded in spring 2002. Drip irrigation was installed in 2001. This vineyard represents a commitment to continued research on Zinfandel. The project continues to expand the understanding of Zinfandel, and we are excited about what will be achieved.

The range shown in growth and yield parameters thus far fuels our hope that there is significant variability within the Zinfandel Heritage selections. Using the Heritage Vineyard as a base, we hope to identify Zinfandel selections that will achieve the status of clones and play important roles in the production of Zinfandel for years to come. ■



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WINEGROWING

EARLY DEFICIT IRRIGATION

Reading vines to manage wine quality

Stress Index 3: Shoot-tip growth has stopped; tips have begun to fall back behind expanding leaves; canopy is green (excluding any leaves yellowing from lack of sun). Sun leaves can feel warm at midday and shade leaves are still relatively cool.

BY **Carol Caldwell-Ewart**

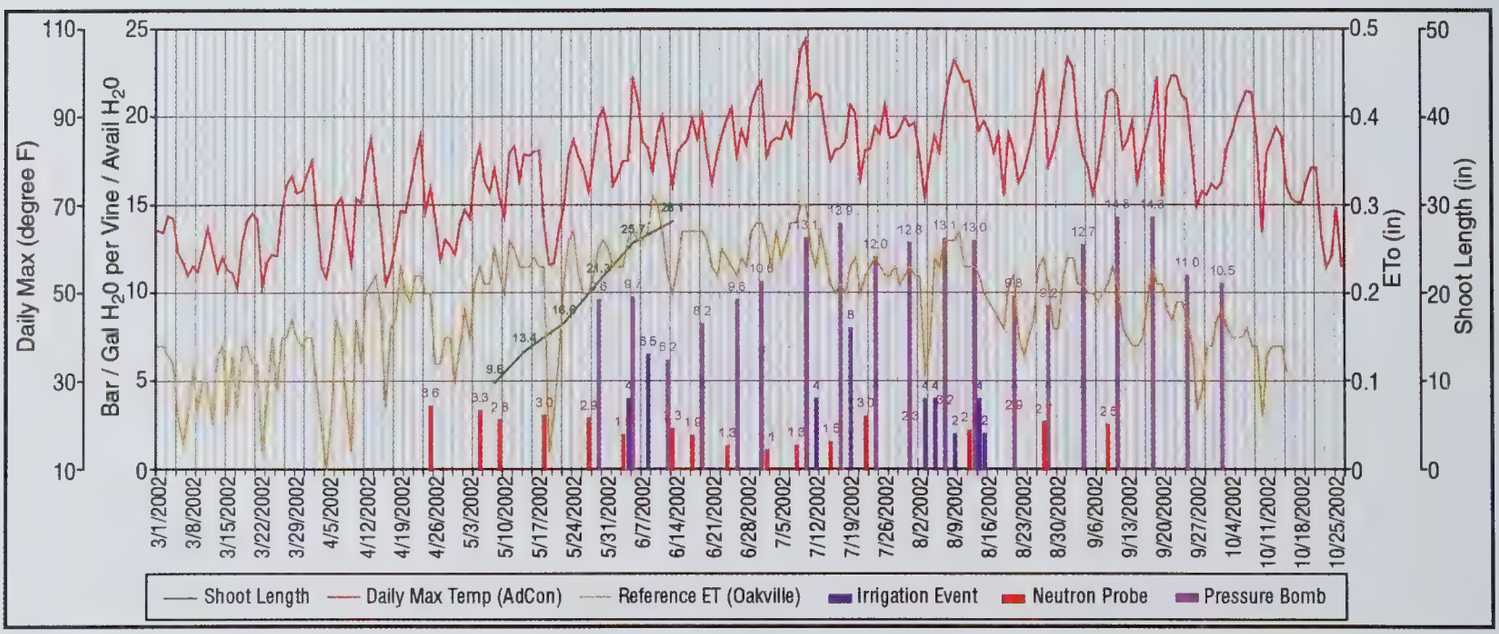
Early deficit irrigation is growing more and more important for red wine growers in California. Many growers believe that too much water early in the season may dilute red wine quality, but with too little water late in the season, the only thing ultra-ultra premium wine grapes would be good for is Raisinettes.

Richard Camera, director of vineyard operations at Hess Collection (Napa, CA), and Bryan Rahn, Coastal Viticultural Consultants (CVC, Napa Valley), are excited about the methods they have developed to more effectively manage early deficit irrigation of ultra-premium wine grapes, specifically Cabernet Sauvignon, Merlot, Cabernet Franc, Malbec, and Petit Verdot.

Rahn combines high-tech measurements with low-tech grapevine assessment to help growers perfect irrigation management to a degree not possible before. CVC viticultural consultants provide services related to soils, plant nutrition, and irrigation management to grapegrowing clients in northern California, including Hess Collection and several of the growers who sell to Hess.

The high-tech data collection of Rahn's approach includes neutron probe and pressure chamber readings. In a low-tech assessment, Rahn and his CVC colleagues literally put their hands and eyes on the vines to determine the physiological status of grapevines. They measure shoot length and

Table A: Mont La Salle - Block 13



Vine Identity: Variety: Cabernet Sauvignon; Rootstock: 3309; Year planted: 1997; Trellis: Vertical; Spacing: 4 x 4; Acres: 1.46

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assess vine stress, using a stress index that ranks shoot-tip growth, leaf color, and leaf temperature, from 0 to 5 (see photo captions). They evaluate leaf temperature by feeling sun leaves and shade leaves.

Others have also put together schedules for shoot-tip rating, though Rahn has developed his own, but he believes that CVC was the first to combine it with assessing canopy temperature and color. "As we get further into deficit irrigation in California, we are trying to make better assessments of stress in plants. We're looking for tools to identify the physiological changes in the grapevine. In most cases, those changes can be seen and felt."

Hess uses CVC's data, and collects its own, as well. The winery has a full-time geographic information systems manager, Seth Schwebs, responsible for developing what Camera believes may be one of the most comprehensive vineyard databases in the industry. The winery produces a graphic composition of all the data that is used to manage irrigation (see Table A). This provides a picture of the vineyards every week. "We're still fine tuning," says Camera, "but we're excited and banking on success."

"Deficit irrigation is farming right on the edge," Camera says. "We are farming so close to the edge that a weather event can hurt us, and we want to have as much of a cushion as we can get." Hess's extensive data collection plus Rahn's method give him that cushion.

High-tech data collection

Hess acquires new multispectral images of the relevant vineyards every year and uses those to choose sites for neutron probe access tubes. CVC takes readings for Hess at eight sites on 360 acres on Mt. Veeder. The winery also has four sites on 180 acres in American Canyon (which also has EnviroScan moisture monitoring system) and 10 sites on 212 acres in Pope Valley. (The remainder of the 1,200 acres that the winery owns or controls in California are primarily planted with white wine grapes, which don't require the kind of deficit irrigation control that red grapes demand.)

Neutron probe access tubes are placed to give data representing a par-

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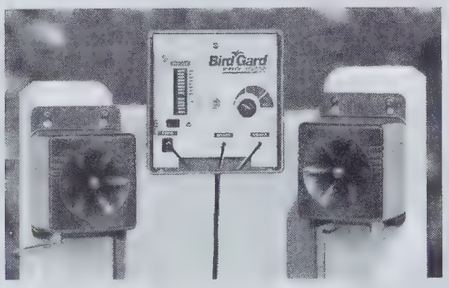

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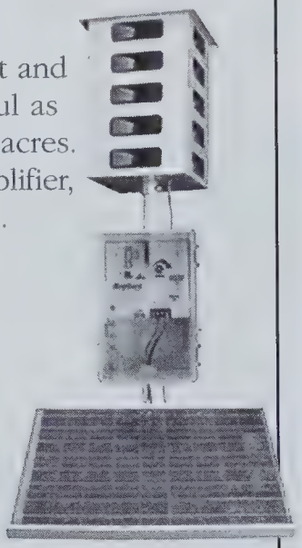

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Stress Index 0: Tendrils past the tips, vigorous growth.
Photos by Richard Camera.
Stress Index by Coastal Viticulture Consultants (CVC).

Stress Index 1: Growth begins to slow; tendrils are not very far past tips.

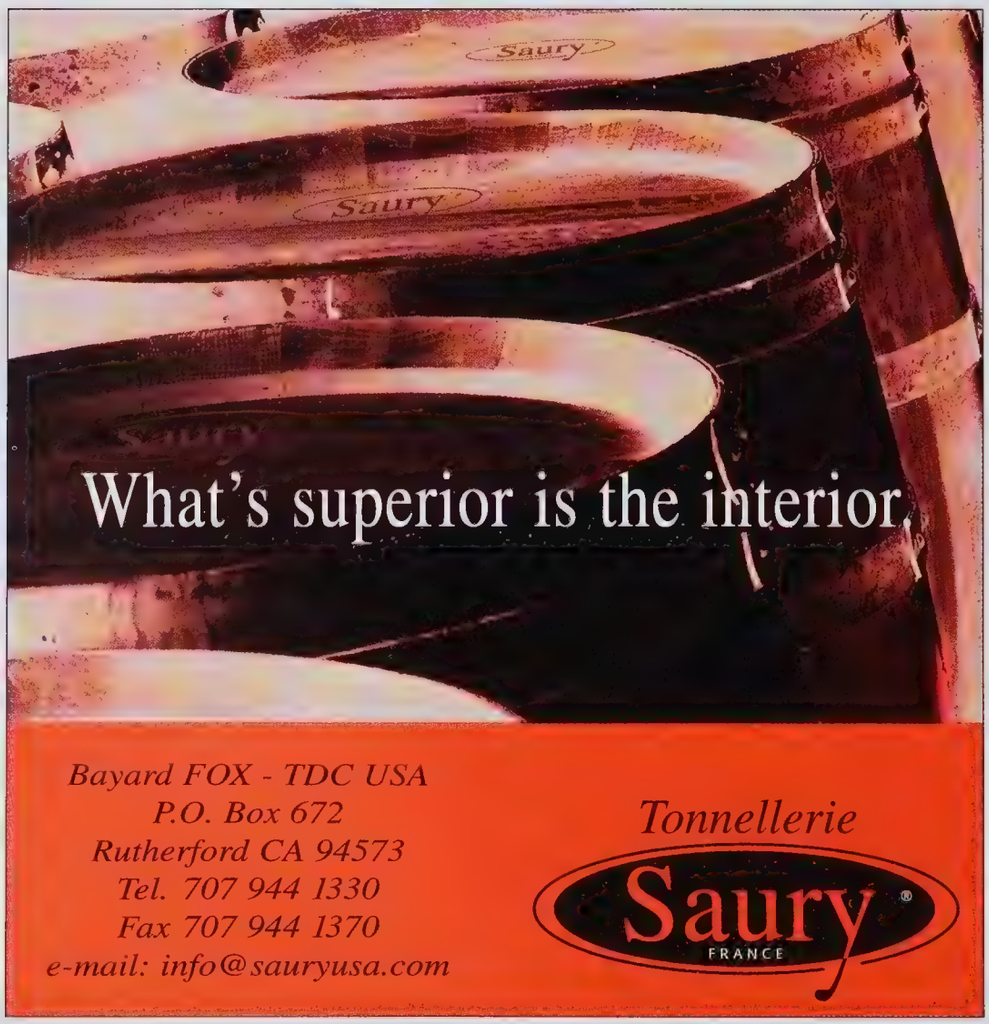
ticular growth pattern and to cover the widest area possible, and readings are taken every week from May through September and sometimes into October. Pressure chamber (pressure baum) readings and plant measurements are all gathered around the same sites, so the data all have a relationship to each other. Hess also adds maximum daily temperature from AdCon stations and evapo-transpiration readings from the CIMIS station in Oakville. "We collect data right up to harvest," says Camera.

Low-tech data collection

In working with other clients, every time CVC viticultural staff goes into a vineyard, in addition to gathering pressure chamber readings and measuring shoot length, they are looking at three key plant stress indicators — shoot tips, canopy color, and leaf temperature.

"Assessing shoot-tip stress is very low tech," says Camera. "Anyone can do it. The only software you have to program is your own brain." Rahn agrees. When the tendrils extend way beyond the shoot tips, the vine is grow-

Stress Index 2: Slower growth. Growth has slowed to the point where tendrils are even with tips; canopy is green, and both sun and shade leaves are cool to the touch.



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ing vigorously and under no stress. As growth begins to slow, the shoot tip catches up with the tendrils, and gradually, when growth has stopped, expanding leaves grow beyond the shoot tip (Stress Index 3). Eventually shoot tips can dry up and fall off (stress indicators).

Meanwhile, Rahn and his colleagues are also watching for physiological changes in the leaves, and when they begin to affect canopy color. "We're looking at when the basal leaves begin to yellow from water stress," Rahn explains. "Sometimes the yellowing can result from something else (senescence or shading), so you have to pay attention to other possible causes, but with good light exposure in your canopy, yellowing basal leaves should indicate a transition in the vine."

Assessing leaf temperature is equally easy, Rahn claims. "CVC is probably the only consulting company out there feeling leaves. But if you feel a person's forehead, you can tell the difference between 98°F and 101°F. That's what we're doing with feeling leaves. It's not hard, but it takes time to learn to calibrate what you feel."

When leaves are cool, the stomata are open and the leaves are transpiring, there's plenty of water, and the vine is growing (Stress Index 0, 1, 2). "If the sun leaves are transpiring, there is little water stress," Rahn explains, "but as the sun leaves get warm (Stress Index 3), you know the plant is under moderate stress. Then you should watch your vineyard closely, and know the soil moisture status." When the vine is under higher water stress, shade leaves begin to get warm, too (Stress Index 4).

Rahn says technology helps validate the vineyard observations. "When you get tuned into what a stress index looks and feels like, you can make the assessment without having to do pressure chamber readings all the time." This way he can extrapolate his stress index assessment into a much wider area of the vineyard.

For growers who can't afford the high-tech approach, the three key indicators, plus a shovel or soil auger to help them assess soil moisture, will take them a long way. "If you're good at assessing stress index and can determine the soil moisture status, you can do quite well," assures Rahn.

Once the stress index assessment is made, Rahn finds, "What you generally end up with is more than one stress index rating in any vineyard. One portion of the vineyard may be a three and elsewhere it's a four or a five. Typically we do a primary number and secondary number, Stress Index 3/4, for example. After a while, you learn where to look for the extremes."

Once Rahn and Camera have gathered all the data, how do they decide when to irrigate?

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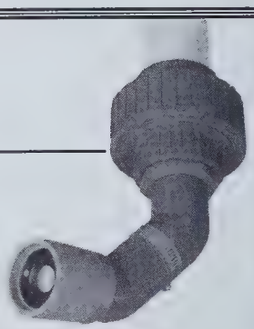

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Using data to plan irrigation

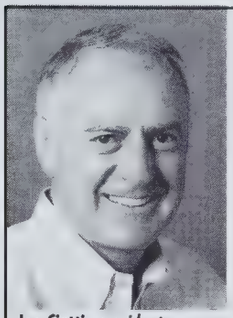
Basically, says Rahn, "When leaves are feeling warm and growth has stopped (Stress Index 3) or the pressure chamber reading has reached the target point (13 to 14 bar), it's time to consider doing something about it. I use both low-tech and high-tech data, plus experience, to decide when to irrigate." Camera adds, "What you're really looking at is the relationship between all the data."

"If the vineyard is under low or moderate stress and we know a heat wave is coming, we use soil moisture data to help predict what will happen," says Rahn. "I use soil moisture measurements, because I want to anticipate when the vines will get to a particular stress level.

"It can take a week or two for irrigation to have a measurable impact on grapevines. If the stress index is a four, irrigation won't change the vineyard this season, but you can hold the vines where they are. If the stress index is a one or two, irrigation can stimulate new growth.

"Generally, we keep vines at level 2 or 3 and allow them to go to level 4 at the end of the season."

"We want growth to stop after shoot length reaches 36 to 40 inches," explains Camera. "Any more and wine quality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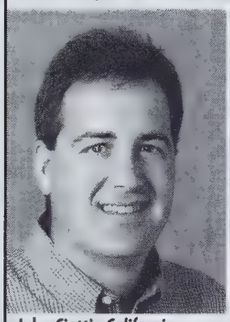
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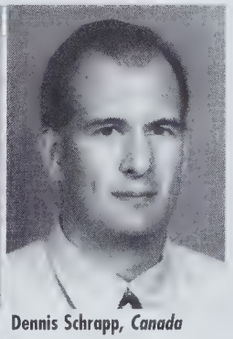
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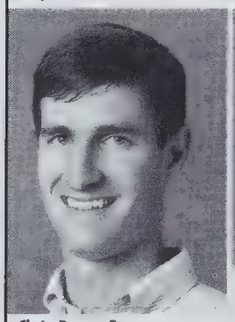
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suffers, plus we have to pay the labor to cut the excess back. We want to achieve as much growth as we can quickly and then plateau it out, usually about Stress Index 2/3. Once we've gotten to that point, management becomes easier. Water won't bring the vines back much, and so we can be more generous with water after a heat event, for example. It makes growers sleep better when we can be more generous."

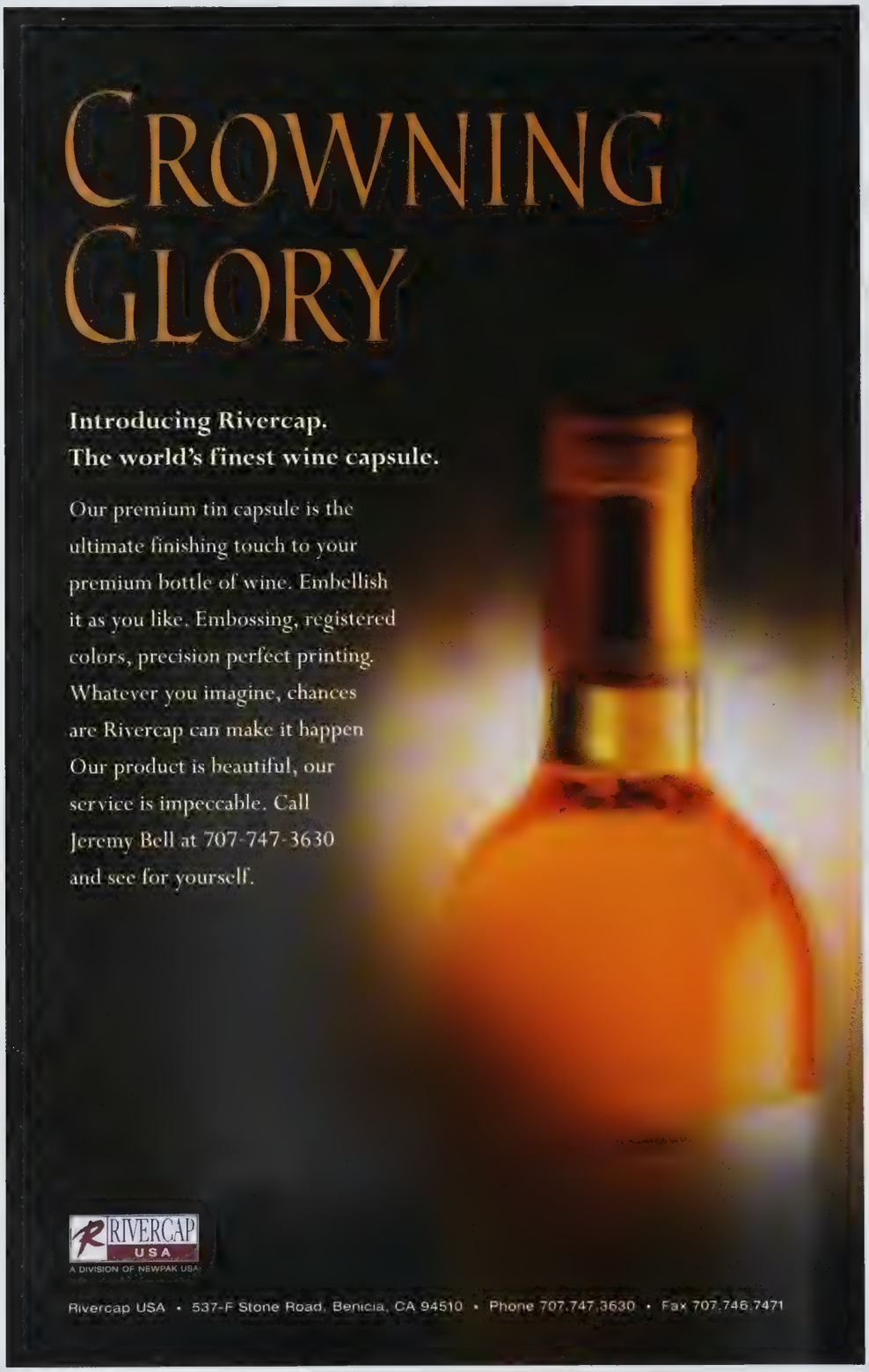
Camera says Hess is striving for a balanced vine that vertically fills out the trellis. "Usually we trim at least once and put the brakes on growth by knowing when not to water. We trim it and it doesn't regrow, and we don't get laterals elsewhere on the vine. If you trim the top and keep watering, you will get lateral growth, which will make a mess in the fruit zone.

"We want to maintain canopy until harvest. We don't want to see basal leaf loss, because that means the vines are not getting enough water. We water virtually to harvest because we want to keep the little factories going, making sugar."

Continued on page 78

Stress index 4: Tips are behind expanding leaves; some basal leaves begin to yellow; sun leaves feel warmer in the heat of the day and shade leaves begin to feel warm too. A few tips may be dried up or missing.

Stress Index 5: A significant number of the growing tips are dried up or missing. There is substantial yellowing in the canopy, leaf scorch and some dried leaves. Sun leaves feel hot and shade leaves are very warm to hot. Fruit damage may be visible (dehydration, raisining).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A rainbow spectrum of flavors

Symbols for four flavor themes in Flavor Spectrum are: (from top left) Contrast, Controversial, Mirror, and Outside the Envelope.

BY Millie Howie

"Expert or novice, we all need to learn to trust our palates," says Barbara Hom. She created The Flavor Spectrum, an educational food and wine pairing experience, to help people do just that. Owner of Night Owl Catering, Hom offers Flavor Spectrum seminars around the world. Her seminars, she suggests, help even people who are very knowledgeable about wine broaden their perspectives about which food can be partnered with a particular wine.

The idea for the Flavor Spectrum began about six years ago when Hom was asked to prepare a winemaker dinner for a Sonoma County winery. The winery contact requested that she prepare four very specific foods to be served with the winery's Gewurztraminer, Chardonnay, Pinot Noir, and Late Harvest Riesling. When Hom suggested she'd rather create her own menu, she was told that those four dishes were always served with the winery's wines. Hom did as requested, and the dinner was a disaster. The 10 guests barely touched the food.

"The next day I prepared another winemaker dinner for another winery. Winery personnel gave me a free hand to match their Chardonnay, Cabernet Sauvignon, and Late Harvest Riesling to whatever I felt worked," Hom recalls. "I had a great time, choosing to do scallops with a coconut cream sauce with the Chardonnay, rib eye steak with the Cabernet, and pear ice cream and pear tart with the Late Harvest wine.

"The winery owner was very pleased and asked me to come out to be introduced to the diners. What a surprise! It turned out to be the same group who had given a thumbs down the night before, but now they were enthusiastic about what they were tasting.

"When I think about wine, I think of it as food," says Barbara Hom.

"Later I checked the sales of the wines presented at each of the dinners. The wines from the group that had the preconceived wine and food matches showed no increase in their sales. The wines in the other group, where the people had a higher quality experience, were going great guns."

These experiences prompted Hom to think about combining foods and wines that worked well together whether or not common wisdom believed they did. "I felt that with my cultural background — I was born in China, where my father was a master chef who served on the luxury ships of the American President Lines — I might be able to bring an added dimension to the experimenting I was doing.

"As I got more involved, I found a wide variety of ways to put wine and food together. Sometimes all the components worked together. Sometimes contrasting flavors enhanced each other. Sometimes my approach was 'Let's try this to see how it tastes,' and sometimes I looked on the pairing as a challenge, 'Everyone says this won't work, but I'm going to try it.'"

Eventually, she refined her explorations into a seminar format. The

Flavor Spectrum is based on four flavor themes: *Mirror* — dishes that reflect the flavors found in the wines; *Contrast* — two quite complimentary flavors that work to enhance each other; *Outside the Envelope* — partnering foods one would not traditionally expect to be appropriate with a specific wine and discovering a new taste sensation; and *Controversial* — pairing food and wine flavors that can cause real love or hate reactions.

The Flavor Spectrum is designed to lead consumers along new paths of enjoyment through some daring explorations of how flavors are identified by their palates.

"There is no set way to introduce people to the Flavor Spectrum," explains Hom, "although usually guests are seated and four or five wines are served, along with small tastes of foods in the four themes of the Spectrum."

"I think we need to be more daring and exploratory," says John Engelskirger, Turnbull Wine Cellars.

At the 1999 Sonoma County Wine Showcase, Hom led a group of attendees through a Flavor Spectrum tasting, using a single wine, The Godwin Wine Group's 1997 Huntington Chardonnay, with four theme dishes.

In the Mirror selection, salmon prepared with toasted coriander seed and lemon grass echoed the rich flavor of the wine, and added an undercurrent of lemon zest.

For the Contrast, Hom offered a grilled cheese and avocado sandwich, which worked well with the crisp, freshness of the wine, although she admits the combination could work as a Mirror almost as well.

Hom prepared skewered grilled chicken with Thai peanut sauce to illustrate a Controversial pairing.

Her choice for Outside the Envelope was a surprising harmony with caramel ice cream.

Recently, John Engelskirger, winemaker at Turnbull Wine Cellars, Oakville, CA, was invited to present three of his wines as subjects for a Flavor Spectrum exploration. From the

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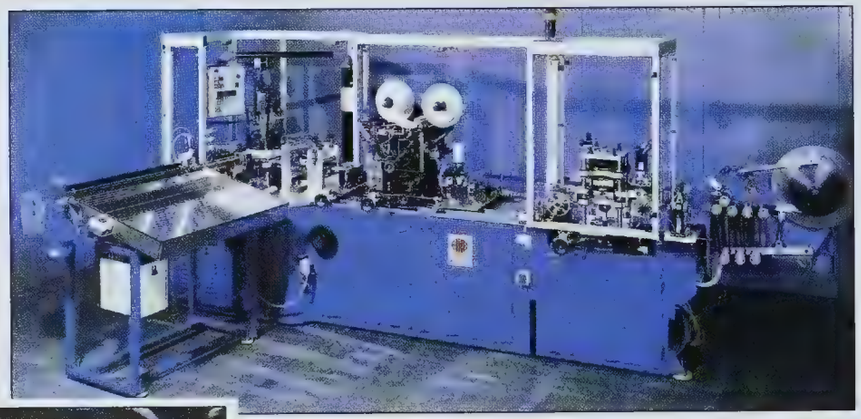

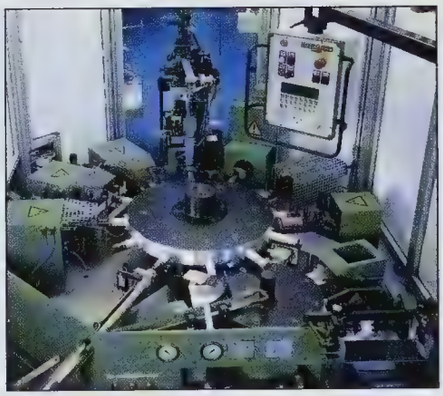

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wines he sent to Hom for consideration, she selected the 2000 and 2001 Sauvignon Blancs and 2000 Syrah.

"I have never worked with two vintages of the same varietal before," Hom comments. "But when I tasted these two Sauvignon Blancs, I discovered they were so entirely different that it was exciting to find foods that worked well with them."

2000 Turnbull Sauvignon Blanc

The 2000 Turnbull Sauvignon Blanc is the third vintage Engelskirger has produced. "Turnbull grows 16 grape varieties," he explains, "and I never make the same wine the same way twice. The approach I use depends on the fruit and what I see in the young wines.

"The style of the 2000 Sauvignon Blanc is more like the wines of Sancerre — 85% fermented in stainless steel, 15% in new French oak. Half of the Sauvignon Blanc is the Musque clone grown in our Oakville Estate vineyard, which gives the wine more of a lime quality. The other half of the blend is another Sauvignon Blanc clone providing a more herbaceous quality. We also blended in 7% Viognier and 4% Malvasia Bianca. These two make the wine more aromatic."

"When I think about wine," says Hom, "I think of it as a food. When I tasted the 2000 Sauvignon Blanc I found a high apple aroma in the nose; my chef thought it was more like kiwi.

"For a Mirror match, we dressed a small, crisp, raw Kumomoto oyster in the shell with a kiwi salsa. I really like to incorporate as much diversity in ingredients as I can and note the way certain combinations serve to intensify specific flavors and impressions."

The combination, Engelskirger felt, made the wine seem warmer and rounder, as flavors of the kiwi were echoed in the wine. "Another thing I like about this exercise is that we are taking time to pay attention to mixes and matches," he remarks. "So often, when we are eating and drinking wine, we have moved on to the next bite so quickly that we miss the lingering

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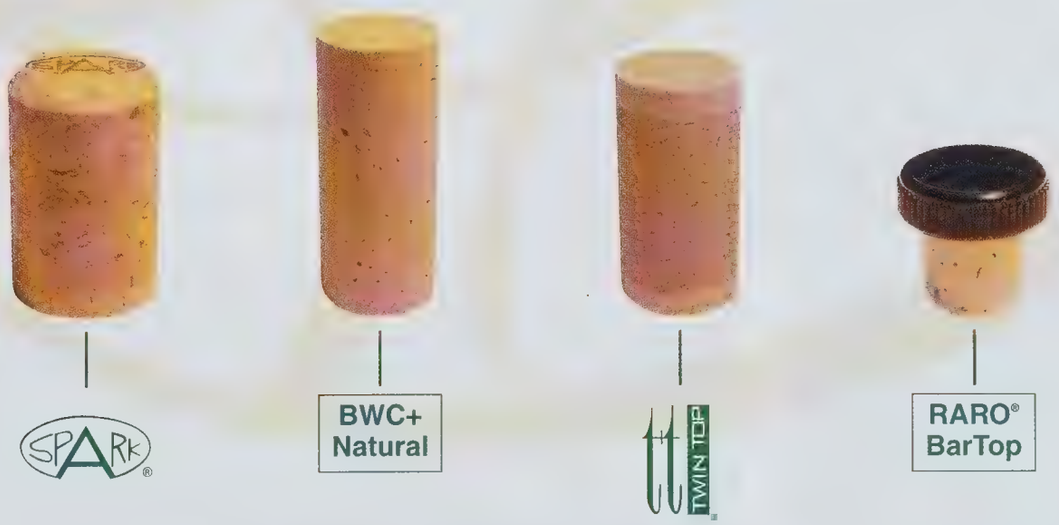

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flavor sensations of what we have just tasted."

"I think John has just expressed one of the benefits I see in this type of seminar," confirms Hom. "We are taking time to note our various impressions. There is no 'right' or 'wrong.' Whatever each person likes is totally fine. Each palate is different from every other."

For the Contrast selection, cream of celery soup was served with crème fraiche. "In this combination, the cream balances nicely with the steely, mineral acidity of the wine and makes the wine taste creamier as well," Hom comments.

Artichoke tempura with lime aioli sauce was prepared to go Outside the Envelope. This combination of flavors brought out the full fruit flavors of the wine, while diminishing its vegetative characters.

"We are traditionally told that artichokes do not go with wine," Hom states, "so I decided to try this. I think the pairing is a good one, although not the only one, nor is this method of cooking the only one we might have tried.

"I am very specific about deep frying. One important factor is that the food actually requires less fat when deep-fried correctly than it would if sautéed. It all depends on the temperature of the food and the oil. The food must be at room temperature, so it does not absorb the oil. The way I make tempura is not the usual way, since I give the vegetables a light coating of panko (Japanese crumbs) after dipping them into the batter."

Engelskirger offers a purely personal reaction. "The reason I like Sauvignon Blanc, is that I grew up in the Sierra foothills, and I loved the smell of the air in spring and summer — water running over granite rocks in the sunlight. The first two matches Barbara prepared made sort of a 'flowing' sensation, smooth and even. This third pair is so subtle and beautiful yet it leaves my tongue buzzing and alive with sparkle."

The truly Controversial duo was golden delicious apple mousse with a nougat crisp, which Hom suggests might be a bit too over the top with its dusting of crisp nougat. Engelskirger felt the dish made the wine taste slightly sour.

"I don't know that much about food pairing with wine, but the notion of exploring and giving up any preconceived notions is a great one," he adds. "The winemaker makes a wine, but it is totally up to time and place and the

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experience of the consumer to define if the wine coincides with either the winemaker's or the consumer's preconceived notions.

"The importance of taking into account the cumulative impact of one taste on the next cannot be underestimated. Foods that 'stick' to the tongue's receptor sites can have a continued and sometimes detrimental effect on flavor perception for quite a long time. Anyone who has attempted to taste a flight of red wines after eating chocolate ice cream can attest to this fact!"

2001 Turnbull Sauvignon Blanc

Hom notes that when she opened the 2001 Turnbull Sauvignon Blanc, she found a nose that was both floral and tropical. "The style of this Sauvignon Blanc is decidedly different from the 2000 vintage," she observes. "It seems to be less austere."

The difference between the two wines, explains Engelskirger, lies partly in the blend, which contains 7% Semillon along with the Viognier and Malvasia Bianca, and partly in the higher percentage of barrel fermentation, with 60% of the grapes fermented in stainless steel and 40% barrel-fermented. This, he feels increased the creamy aroma and, because the wine is higher in pH, he says it is less "bouncey."

Hom presented oven-roasted macadamia crusted sea bass with passion fruit coulis for the Mirror selection. "I always marinate proteins before cooking," Hom explains, "and for this I used a little ginger. There is a touch of honey in the coulis, which I think made it more rich and fulfilling."

Engelskirger suggests that the combination of the nutty coating and the ginger in the marinade made the food mouth-coating and made the wine taste richer, with the nutty flavor continuing on as an added flavor in the wine.

Pearl balls, the Contrast dish, were balls of ground pork, chopped shiitake mushrooms, and water chestnuts, rolled in pearl rice and steamed. The combination lifted the flavor, and when paired with the wine, the effect of the tempting aroma was to set your mouth watering before you had even taken a bite, notes Engelskirger.

Hom went way beyond Outside the Envelope with chili verde made with pork, dried raisins (which had been marinated in the wine), and Anaheim chilies. She admits that this is not a combination to go with Chardonnay. "I think Sauvignon Blanc is a much more food-friendly wine than Chardonnay," she states. "I really like how the subtle qualities of this wine enhance the food flavors."

Hom's more surprising Controversial choice was a pineapple crepes dessert. "This I thought of almost as soon as I caught the tropical fragrance of the wine," Hom recalls. "For the

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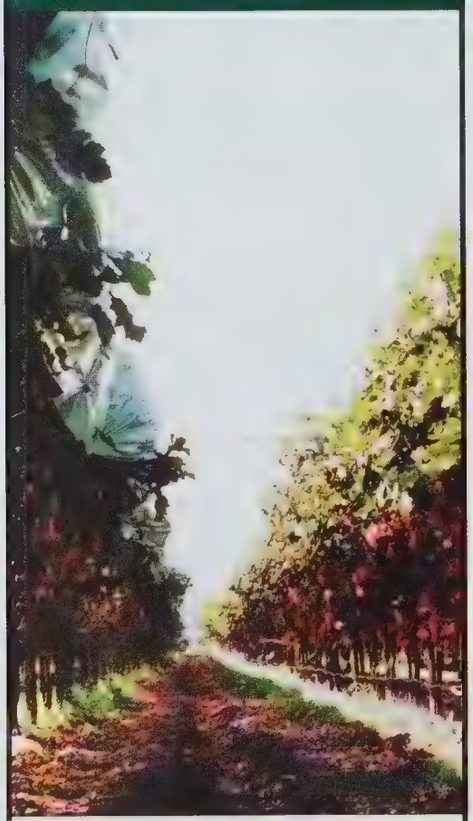

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pineapple filling, I chose almost overripe pineapple in small dice, well-drained, and sautéed in butter. I added a tiny scoop of ice cream with the pineapple as well, but that was just a little extra touch I wanted to try."

Engelskirger found this blend perfect. "When I took my first taste, I feared that the ice cream would affect the flavor of the wine adversely. Instead, the mildness of the crepe made the flavor impression dry and really cooling. I think this would be a prefect dessert on a warm day.

2000 Turnbull Syrah

"Syrah is just about the easiest wine that I make, never the problem child. If the grapes are fully ripe, we just crush, ferment in stainless steel, put the wine in barrels, then forget about it. Voila! Less challenging … tastes great! Grapes for the 2000 Turnbull Syrah came from two vineyards in Oakville.

"We think the wine is somewhat unusual. If Syrah grapes are grown where it is quite hot, the flavor might be described as gamey. If grown in a cooler climate, the impression would be nearer white pepper. Our Syrah is somewhere between the two; a little more in the Bordeaux style than Rhône and I think it is very elegant."

Hom said just two words: "Rose petals. That was the impression I got when I uncorked the bottle; then I caught nuances of strawberry and a hint of clove and cranberry and then my very favorite spice of all, star anise."

To Mirror flavors in the wine, Hom prepared a tender breast of duck marinated with soy, star anise and ginger, and topped it with a blueberry/raspberry sauce.

Offering Contrast, Hom prepared a simple offering of Point Reyes blue cheese, as elegant in its way as the wine. "There is something about the nutty quality of the cheese that is ideal with this wine," she observes. "I can imagine sitting around with friends, listening to good music, and talking about nothing of any importance, but just enjoying the evening and the company of each other. With this coupling, I think we achieve a holistic experience that makes both the wine and the food more perfect."

Tender sea bass took on an entirely new dimension, pushing way Outside the Envelope, when served with a Peking sauce made with pork, ginger, soy, hoisin, and oyster and plum sauce. Engelskirger, noting that all matches are not made in heaven as far as his palate is concerned, found the sauce a bit sweet for pairing with the Syrah, and the overall impression for him was that the dish was texturally drying.

Naturally, since this opinion totally reinforced Hom's repeated reminder that everyone has a different palate, Hom was pleased to hear Engelskirger's reaction to the pairing. Reemphasizing this logic, she then moved on to the Controversial match.

"There are no generalities about pairing wine and chocolate," she states. "Just as there are dozens of varieties of wine, there are myriad types and styles of chocolate. There never is a single clear-cut choice. There is a popular notion among some chefs that the right place for dense chocolate cake decorated with a rich raspberry sauce is next to a glass of red wine and there are chefs who think quite the opposite. I find this combination fits into the Controversial mode far better than Mirror or Contrast, and that is how we worked within the traditional format with chocolate cake and Engelskirger's Syrah."

As if to prove Hom's point, however, only two out of 10 people present felt this pairing worked as well as any of the other pairings during the seminar.

Conclusion

At the close of the presentation, Engelskirger commented that going through the Flavor Spectrum had been a stimulating event. "So often we winemakers, and the general public, have preconceived ideas about what foods would be most suitable for serving with our wines, but as Barbara has shown us, I think we are missing a lot of fascinating combinations. I think we need to be more daring and exploratory." ■

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Ohio wineries "steak" out on-site sales opportunities

BY Donniella Winchell,
Ohio Wine Producers Association

An innovative food and wine program has helped fuel considerable growth at many wineries in Ohio, and judging from incoming calls at those wineries, the concept has elicited a steady stream of interest from industry colleagues in other states. Wherever they have been implemented, steak cookouts have been responsible for expanded traffic in tasting rooms, increased carry-out sales, and enhanced consumer awareness of regional wines.

Steak cookouts are especially appealing to wineries that are unable to offer a full-service restaurant but want food options to meet consumer demands. Unquestionably, these cookouts have become a prime sales and market development tool at many Ohio wineries.

While the midwest has many arcane laws regarding alcohol sales, wineries in Ohio, where Prohibition was born, are able to sell wine for consumption on the premises. The steak cookout format provides a perfect opportunity to capitalize on that setting.

Where permits restrict on-premise sales or consumption, wineries have set up cookouts on their property, where those restrictions do not apply. In other instances, they have worked with local caterers to do events off-site — often at the caterers' venues. Whatever the setting, these activities highlight food and wine pairings, bring diners to wineries they might not otherwise visit, encourage tasting opportunities, and drive the sale of many cases of wine.

The first (and most successful) of the model programs is at Valley Vineyards in southwest Ohio, a short drive from Cincinnati. At the height of summer, the Schuchter family (winery owners) serve as many as 1,500 steaks and sell at least 750 bottles of wine at full retail each weekend. Large crowds gather to "cook your own steak" throughout the spring and fall seasons.

There are at least 12 other wineries in Ohio that have taken the Schuchters' concept and adapted it to their own circumstances, effectively generating significant cash flow for both food and wine.

For about $50 per couple (price varies according to price point of wine ordered), Valley Vineyards offers two high-quality strip steaks, baked potatoes, pasta salad, a "famous" pizza salad, breads, homemade desserts, and one bottle of wine. Fresh strawberries and sweet corn are added during the height of those seasons.

Reservations are required, which eliminates concerns about portion control and losses from food waste. Upon arrival, guests are directed to an assigned table, select their steaks which are usually dispensed by one of the family grandchildren — choose a bottle of wine, then walk outside where they gather around a large communal charcoal grill and barbeque their own steaks.

While various other wineries around the state provide wait-staff to cook and serve the meals, at Valley, customers take pleasure from the festive environment as perhaps a dozen guests stand around at any given time, chatting, sipping wine, and enjoying the convivial atmosphere. "Regulars" at Valley Vineyards indicate that great personal friendships have grown out of this informal ritual.

After the steaks are done, everyone returns to a room where a buffet is set up and manned by Schuchter family members. Diners often take home an additional bottle or two of wine, and many use the dining excursion to purchase one or more cases.

While Valley Vineyards began its cookout program as a summer-only activity, its success compelled the

Guests enjoy a "grill-it-yourself" experience at Valley Vineyards.

Schucters to add a large permanent dining area in 1983. The facility now features a full commercial kitchen and natural gas-fueled grills, however, most diners still prefer charcoal grills in good weather. January is the slowest month. These dinners now generate hundreds of reservations each weekend throughout the year. Weeknights are usually reserved for private parties and corporate events.

While Valley Vineyards has a beautiful facility, most rural wineries that emulated their ideas have not constructed permanent structures. Rather, they have opted for more affordable but still festive alternatives such as large tents, redwood decks with a view of the vineyards, or attractive arbors built over bricked patios.

In place of commercial restaurant cookers, multiple charcoal grills work beautifully for many. Many visitors to Valley Vineyards actually prefer real charcoal.

Lasting friendships and life-long bonds with the winery are formed at Valley Vineyards cook-out dinners.

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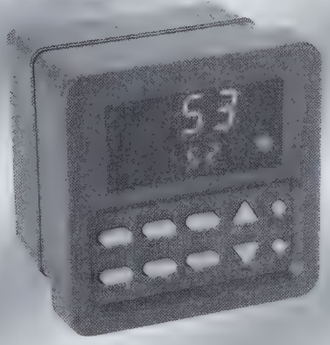

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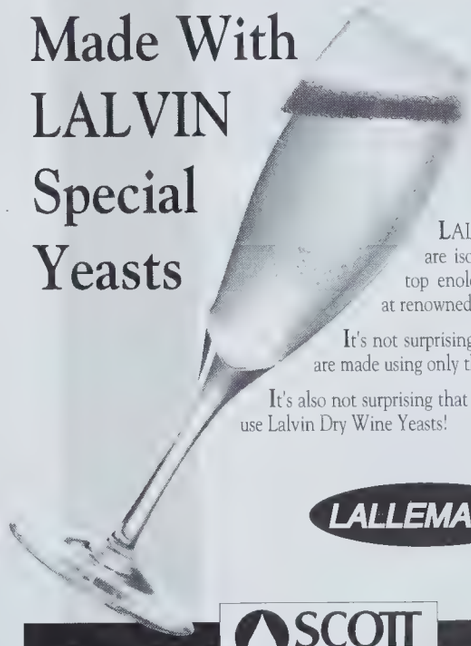

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Several wineries that do not have extended family assistance, or who face local zoning or septic restrictions, use outside caterers. These adaptations still allow them to enjoy full retail margins on their wine while avoiding much of the expense associated with a comprehensive restaurant facility.

Chalet Debonne' Vineyards in Madison (east of Cleveland) has taken the Valley model and adapted it to reflect local dining expectations. While the winery is "out in the country," it faces competition from several nearby full-service restaurants. The Valley "cook-your-own-steak" model did not appeal to Chalet Debonne' customers who wanted more variety and attention from waitstaff. In addition, a 100% red meat format deterred some customers.

A family granddaughter and her husband thus offer "Country Gourmet, fine dining in a casual atmosphere" — a somewhat upscale version of steak cookouts. Entrée selections include two types of steak (a filet or a strip), chicken, ostrich, salmon, bison, and vegetarian options, along with a range of side dishes and desserts. (The bison and ostrich are locally grown on farms near the winery.)

Country Gourmet's dining area is contained under a large white tent surrounded by a white picket fence. The original picnic tables were recently replaced with attractive patio furniture that is set with green and white tablecloths and napkins.

Guests are greeted by a hostess, and entrée and wine orders are taken once the group is seated. Diners then proceed to an extensive salad bar while a chef begins the grilling process over charcoal. A waitress serves wines and calls diners to the grill when their selected main course is ready. Additional staff serve a baked potato and two other vegetables from chafing dishes that keep the food hot. Rounding out the menu are homemade desserts (often including a fresh fruit option), flavored coffees, and iced tea. Country Gourmet operates only from June through September, and it has become extremely popular for small wedding receptions.

This pattern of outdoor dining has been adapted and replicated in dozens of other Ohio facilities. Vinoklet, in Cincinnati, most closely models Valley

Vineyards' program. It offers year-round service and includes a spectacular view of rolling hills and vineyards below the dining terraces. Several permanent structures have been built over about eight years, all designed to accommodate both the steak program and general winery tourism traffic as the winery has grown.

Rainbow Hills in Cochocton, near Ohio's popular Amish Country, built a series of beautiful decks overlooking a reflecting pond with an attractive gazebo and large gas grills to accommodate guests. They too offer only summer grilling.

Klingshirn Winery in Avon Lake, west of Cleveland and Shamrock Vineyards in Morrow, north of Columbus, schedule three or four steak cookouts each summer, add entertainment, and position them as "special events," thus attracting considerable local media attention.

The choice of wines enjoyed at steak cookouts is wide as the wine lists offered. The most popular red wines include Cabernet Sauvignon, Cabernet Franc, the French hybrid Chambourcin, and proprietary blends like Hillside Red (Valley Vineyards), and Classic Red (Chalet Debonné).

One New York winery has adapted Ohio's model. Lakewood Vineyards, which overlooks New York's Seneca Lake, uses the cookout format but has a different marketing focus. Available seating for its three summer cookouts is quickly reserved by local residents and winery regulars. While the dinners do generate a profit for the winery, (guests usually purchase wine to take home), they are used primarily as "thank-you" gatherings for Lakewood's best customers.

All of the wineries offering cookouts use a *prix fixe* format ranging from $45 to $55 per couple, and some add an additional fee if the winery's most costly wines are selected. About 75% of diners purchase additional bottles of wine, usually to take home. Most of the wineries rely exclusively on advertising in their own newsletters and word of mouth from regular customers. None have a line item in their budget to promote the dinners.

All of the smaller wineries began by using outside caterers. As their businesses have grown, several have added amenities to enhance visitors' dining experiences, including live entertainment ranging from dulcimer musicians to jazz quartets. Though all cookouts share the same basic premise, they have evolved over the years to reflect the needs of the particular wineries and demands of their customers, so each has developed its own unique personality.

For wineries looking to add a food option to their marketing mix — and those wanting to sell more wine while providing a memorable experience at their venue — steak cookouts offer an interesting opportunity to add some proverbial "sizzle" to their respective bottom lines. ■

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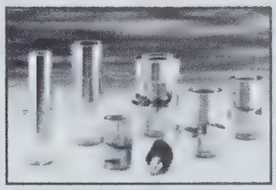

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WINEMAKING

Phenolic extraction in red wine production

BY James A. Kennedy & Catherine Peyrot des Gachons,
Department of Food Science & Technology, Oregon State University, Corvallis, OR

Wine quality is commonly believed to be related to fruit quality. For red wine, another critical parameter is the period of time when phenolic extraction occurs: maceration.[3]

Not only is the style of wine clearly affected by maceration (where any given lot of red wine grapes is capable of becoming a rosé or a full-bodied dry red wine), but also even when a specific style of wine is targeted, the subtleties of extraction can mean the difference between a balanced and an unbalanced wine.

The variables associated with maceration involve phenolics to a great degree. Phenolics are important for the overall color of red wine and its astringency, or more broadly speaking, texture. Therefore, the focus of maceration is to optimize the color and texture of wine.

Combining the variability associated with a vintage with the variability in approaches that winemakers can take toward production makes for a bewildering array of possibilities regarding ultimate wine composition. Advances in maceration techniques are important in the evolution of red wine production. New techniques are developed with the intent to provide ideal conditions for phenolic extraction and development.

Yet given the tremendous variability in fruit composition, the response of fruit to any given maceration technique is highly variable. To customize maceration techniques to fruit composition, it is helpful to consider the fundamental

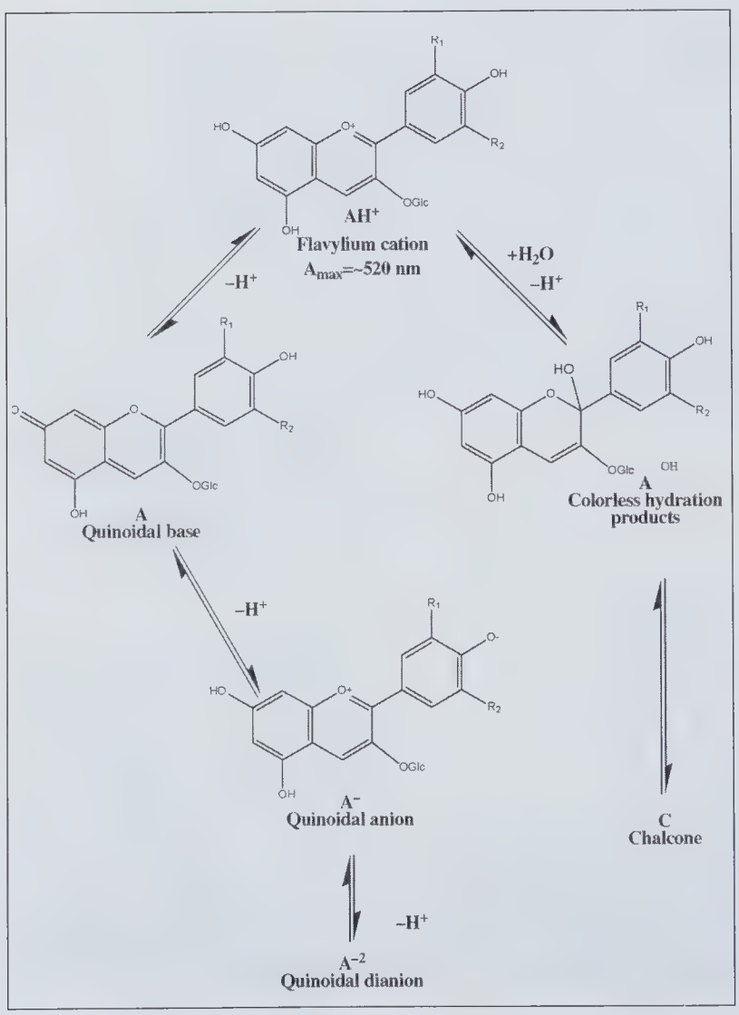


Figure 1. General anthocyanin structure and equilibrium forms.

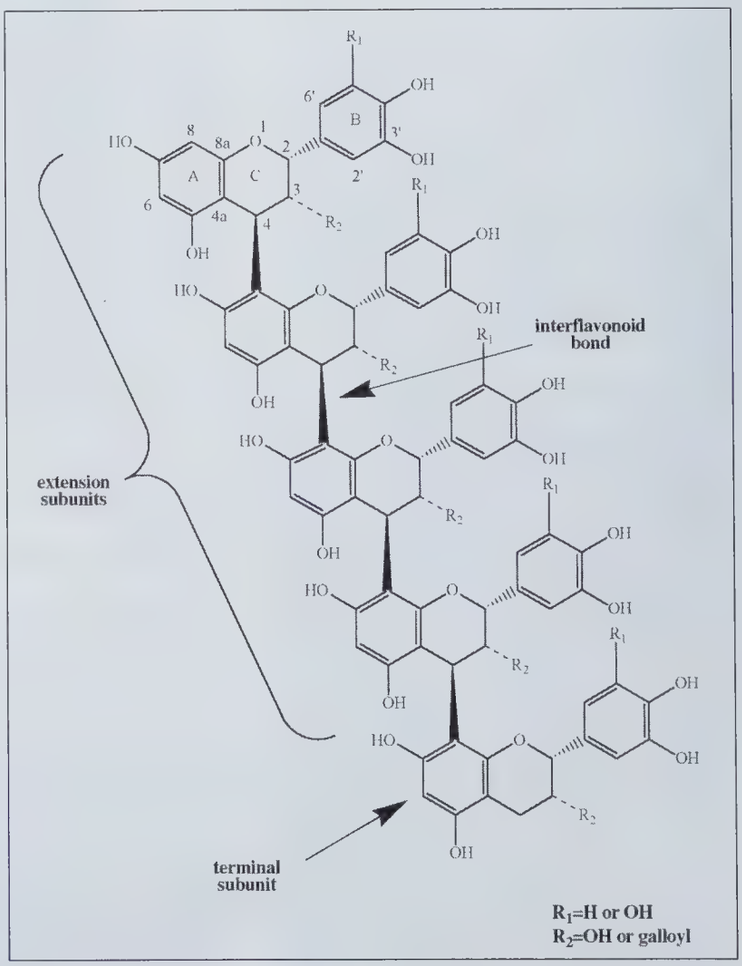


Figure 2. General grape tannin structure indicating subunit and major interflavonoid bond location. Tannins can vary from a single subunit to over 80 subunits in length.

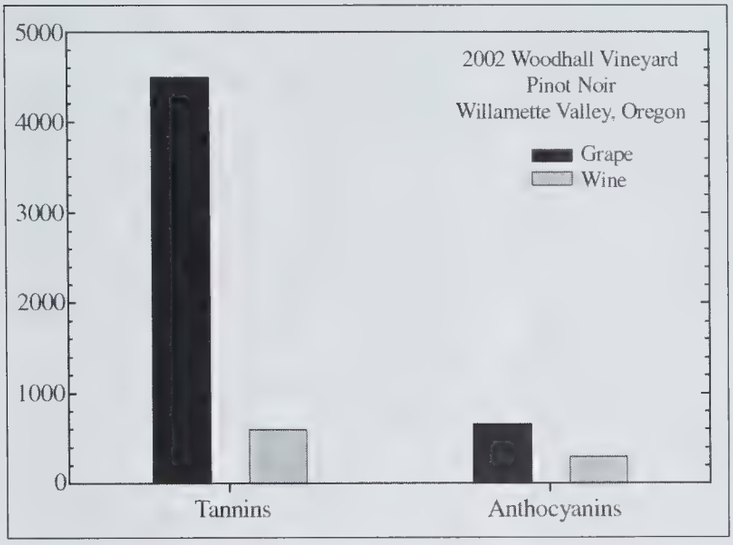


Figure 3. Amount of anthocyanins and tannins in Pinot Noir grapes grown during the 2002 growing season and the equivalent amounts in the corresponding wine (expressed in mg/kg original fruit weight).

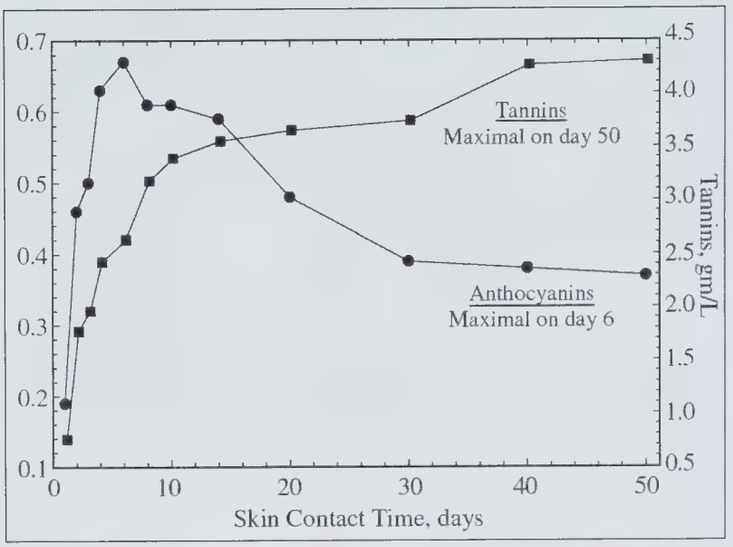


Figure 4. Generalized anthocyanin and tannin extraction during fermentation (after Ribéreau-Gayon, 1970).

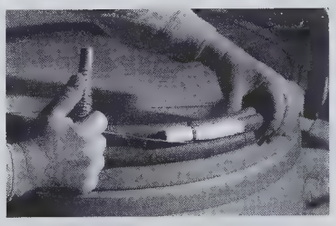
variables that affect the extraction of phenolic compounds.

Compounds of interest

First, let's review the compounds of interest: anthocyanins (Figure I) and tannins (Figure II), which are respectively responsible for color and astringency in red wine.[4,9] These compounds are localized in the solid parts of the grape berry, with the anthocyanins, in almost all instances, restricted to the skin tissue, and the tannins localized in the skin and seed tissue.

The ultimate goal of maceration is to be able to extract a sufficient amount of phenolic material so that a satisfactory balance is achieved. For dry red table wine production, the winemaker generally would like to maximize color extraction while maintaining a balanced wine in terms of tannin extraction (more on this below).

Anthocyanins (Figure I), can exist in several forms, only one of which gives wine its red color (the flavylium form). This form makes up a small proportion of the overall pool of anthocyanins extracted into wine, with the colorless hydration product making up the majority of the anthocyanins. The molecular weight of anthocyanins covers a small range, roughly 450 to 500 g/mol. At commercial maturity, the concentration of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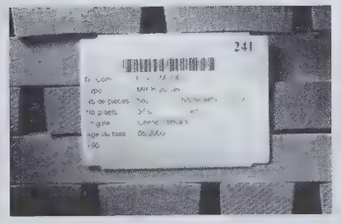
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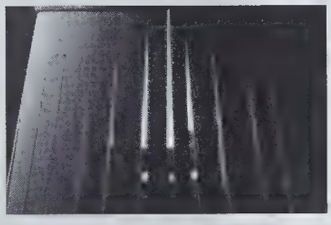
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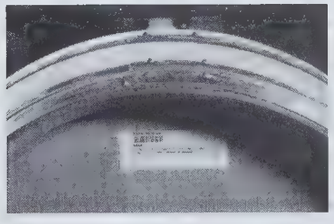
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anthocyanins in grapes will vary from 500 to 1,200 mg/kg. The variation is due to variety, location, vintage, and cultural practices.

Tannins are the second class of compounds of major importance (Figure II), and unlike anthocyanins, their molecular weight can vary tremendously, from a low of roughly 300 g/mol to an upper limit in excess of 20,000 g/mol having been reported. Seed tannins have a lower overall molecular weight distribution than skin tannins, and essentially all of the tannins that have bitterness attributes (lowest molecular weight tannins) are seed-derived.

At harvest, the overall concentration of tannins in grapes is roughly 1,000 to 6,000 mg/kg, with the concentration of tannins in the seed generally one to three times that in the skin. Again, variations due to grape variety, location, vintage, and cultural practices are well established.

Anthocyanin and tannin concentration in wine

If you compare the concentration of anthocyanins and tannins found in grapes with their concentration in wine, it is clear that not all of the grape material ends up in the wine.

Assuming that an average commercial fermentation yields 150 gallons (570 L) of wine per ton of fruit (0.62 L/kg), if all of the anthocyanins and tannins were extracted into wine, a very dark and astringent wine would result. The much lower amount of color and tannin in wine is generally attributable to a combination of fining, incomplete extraction, and the reaction of these compounds during fermentation.

How much color and tannin are actually extracted? Using data collected during the 2002 vintage (Figure III), and for color and tannin extraction, a small fraction of the total amount present in the fruit was actually extracted.[5]

In this study, the maximum amount of color that could be extracted was roughly 50% of what was available, and a balanced wine was achieved when only 15% of the tannins were extracted. These numbers, while informative, tell only part of the extraction story. To fully understand the issues of extraction you need to follow the extraction of these components during maceration.

Extraction of anthocyanins and tannins

...the broad fact remains that in all cases the maximum of color was reached, and its diminution began, long before the fermentation was completed....But during the whole time, there was a steady increase in the tannin contents.

E.W. Hilgard, Dec. 30, 1887

As evidenced above, the general extraction pattern of anthocyanins

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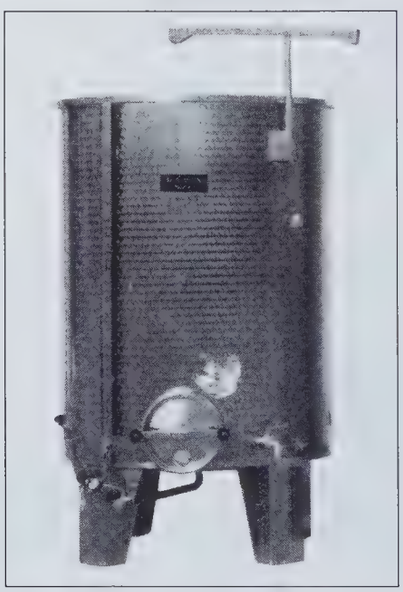
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and tannins has been known for some time. Anthocyanin extraction generally peaks prior to the end of fermentation (two to six days) and tannin extraction increases continuously (Figure IV).

When preparing this report, we conducted a cursory review of the issues that researchers and winemakers have dealt with over the past century, and how their approaches have since changed. What is particularly revealing is that maceration techniques in use a century ago are eerily similar to techniques used today (such as submerged cap fermentations, use of pressure from CO_2 evolution during fermentation to pump fermenting must onto the cap, elevated SO_2 amounts to enhance anthocyanin extraction). What we concluded from this exercise, and what readers should realize is the following:

- Phenolic extraction issues and concerns are perennial, they rarely change;
- Wine production techniques with regard to phenolic extraction haven't changed very much over the years.

Yes, our level of control has improved dramatically over the past century, and yes, there are some new tricks in the bag, but in large part, the issues and approaches are the same.

So, as you read through the latest and greatest innovations in phenolic extraction practices, the daunting equipment options and groovy techniques, it should be comforting to know that there really is nothing new under the rainbow.

What you want to know is: How do you make a specific style of wine from a particular variety? Phenolic extraction boils down to controlling the diffusion, adsorption, and reactivity of anthocyanins and tannins.

Diffusion

Diffusion is simply the process by which a compound moves from a region of high concentration toward a region of lower concentration (such as from the plant cell into the wine). Considering the generally observed extraction curves for anthocyanins and tannins and the effects that wine processing variables have on the rate of these compounds' extraction, the overall process is consistent with diffusion (with a twist in the case of anthocyanins). The rate of diffusion is dependent upon the following:

1. Temperature
2. Molecular weight/size and type of molecule
3. Concentration gradient
4. Cell permeability
5. Surface area over the concentration gradient
6. Composition of extraction medium (such as ethanol concentration).[15]

In all instances except molecular size, these variables contribute positively to the rate of diffusion. That is, an increase in that variable will increase the rate of diffusion.

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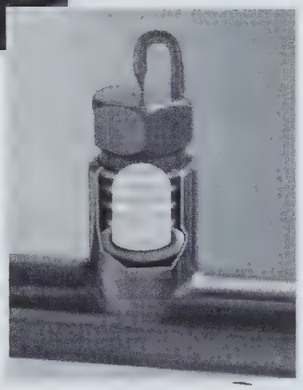

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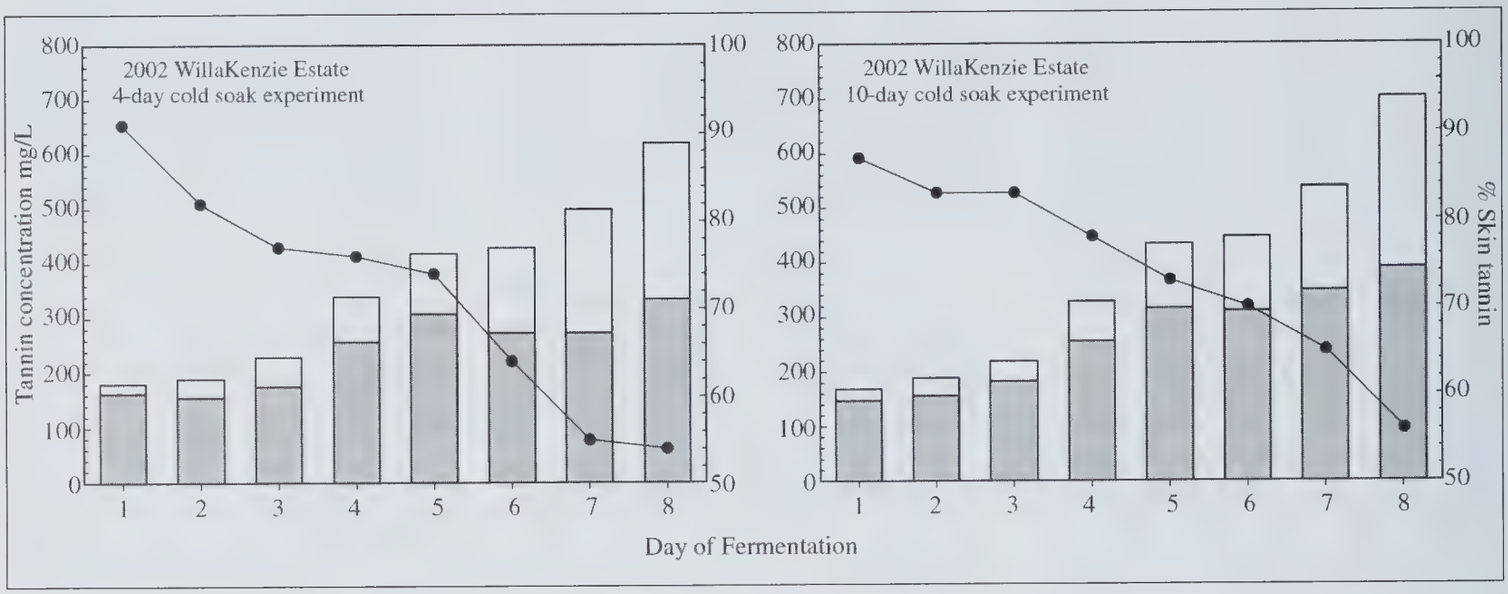

Figure 5. Pinot Noir fermentations with 4-day (upper) and 10-day (lower) cold soaks prior to fermentation showing skin and seed tannin extraction (gray and white bars respectively), and with the % skin tannin (line graph) shown.

perature are the two critical variables in determining the ultimate amount of anthocyanin and tannin present in wine.[1,2,6,7,10,13,14,18] These are easily the most studied variables.

For anthocyanins, higher temperatures reduce the time to maximum concentration, and increase the maximal amount.

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For tannins, higher temperatures increase the rate of extraction.

Besides the most obvious variables of time and temperature, the other variables undoubtedly also play a role in phenolic extraction. Determining their relative importance however is difficult because of the compound nature of their effects.

Regarding molecular size and the type of molecule, this can most easily be seen when you consider the extraction of anthocyanins and tannins. Anthocyanin concentrations increase more rapidly into wine than do tannins (Figure IV). A possible explanation for this is that the anthocyanins are much smaller in size than the tannins, and therefore, will diffuse more rapidly. Additionally, anthocyanins are structurally different than tannins, which may lead to diffusion differences as well.[8]

Explanations other than molecular size and chemistry can be presented to explain the observed differences between concentration changes in anthocyanins and tannins. The difficult-to-separate effects of concentration gradient, cell permeability, and surface area clearly affect the concentration increases observed in fermenting musts.

Anthocyanins and tannins are initially contained within the vacuole of the plant cell. As the plant cell dies, the membranes become leaky and their contents diffuse into the surrounding medium. From a production standpoint, some processes where these factors play a role are:

- Extent to which grapes are crushed;
- Punch-down, pump-over frequency and duration;
- Aspect ratio of the fermentor;

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These process effects can be explained in one or more of the following ways:

- Disruption of cell membranes,
- Increase in exposed surface area,
- Increase in dispersive currents around concentration extremes.

These factors become particularly important with regard to tannin extraction. Since tannins are localized in two different tissues, and given that the sensory properties of these two tannin pools appears to be quite different, there is a considerable amount of interest in controlling not only the amount of tannin extracted into the wine, but also, controlling the compartment from which the tannins are derived.

Missing information

Unfortunately, tannin extraction from the skins and seeds is not understood very well at this time. Studies have been done, and they provide important information in a simplified extraction system.[12,16] Fermenting musts, however, are incredibly complex systems.

We have reviewed some of the diffusional aspects of the system, yet there are other variables that affect the final amount of anthocyanins and tannins in wine. Figure IV demonstrates this very nicely. Although the anthocyanins are extracted with relative ease, they begin to decrease well before the end of fermentation. This has variously been ascribed to adsorption (onto yeast and grape cell wall material), and/or reaction once extracted.

While diffusion is an important part of anthocyanin and tannin extraction, it by no means provides a complete picture of the extraction. In order to fully understand not only the effect of various extraction approaches on anthocyanin and tannin extraction, but also their sensory impact, it is necessary to develop methods that can be used to monitor actual fermentations.

New information

The American Vineyard Foundation is currently funding a research project to improve our understanding of maceration practice on phenolic extraction. The overall goals of the project are to monitor the quantity of tannin extracted from the individual seed and skin compartments, to understand the extent to which tannin proportions can be manipulated through cap management practices, and to understand the overall effect of skin-to-seed tannin proportion on red wine mouth-feel properties.

In our first year of experimentation, we developed an analytical method for determining skin and seed tannin extraction.[11] This analytical method was used to monitor the extraction in commercial-scale fermentations to provide a preliminary assessment of seed and skin tannin extraction. These experiments

took place at WillaKenzie Estate, in the Willamette Valley in Oregon.

In this study, Pinot Noir fruit was harvested and underwent pre-fermentation maceration (~50°F/10°C). The purpose of this investigation was to understand how the duration of cold soaking (4 or 10 days) affected the proportion of skin tannin extracted into red wine. The experiments took place in two 3-ton open-top fermentors.

Following the cold-soak period, the musts were warmed, inoculated, and fermented. During fermentation, samples were taken daily (after punch-down) for analysis. The cap was managed by punch-down, the total for both treatments being similar at the time the wine was pressed (146 and 156 punch-downs for four and 10 days, respectively).

This experiment provides insight into some maceration dynamics (Figure V). Figure V contains the results for both treatments. Both fermentations progressed in a similar fashion, with minor differences in initial fruit composition and temperature during fermentation.

The rationale behind cold soaking prior to fermentation is that the maceration favors extraction of more hydrophilic material and, as such, it is believed that skin extraction is favored. From this experiment it was concluded that cold soak duration did not have a large affect on must/wine composition with regard to:

- Proportion of skin tannin,
- Amount of total tannin,
- Relative rates of tannin extraction.

As the fermentation progressed, the overall amount and proportion of seed tannin increased. Interestingly, the rate of tannin extraction varies in the pattern of increase. Toward the end of fermentation, the data for the treatments deviated, with extraction in the 10-day treatment increasing overall (although the proportion of skin tannin was similar to the four-day treatment). This may indicate that the extended period of time prior to fermentation (10-day treatment), resulted in more advanced grape tissue breakdown, and hence more extraction later in the fermentation.

Information that is being developed from this project will provide not only an improved understanding of the dynamics that affect phenolic extraction during maceration, but will also improve our ability to develop new techniques to control this tremendously important aspect of red wine production. ■

Acknowledgements

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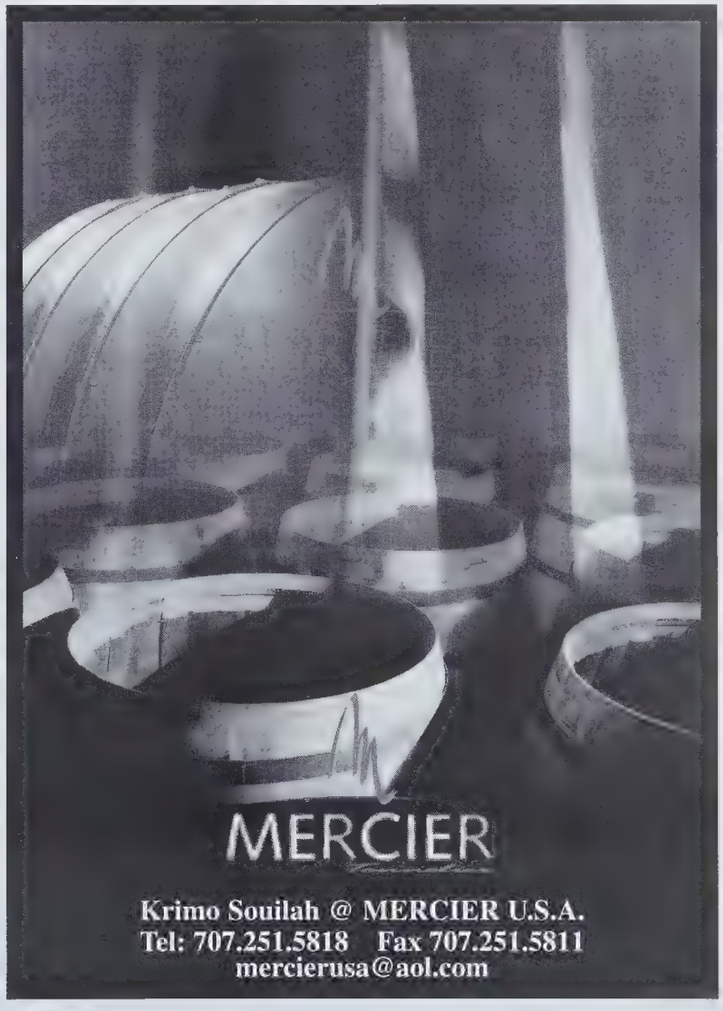

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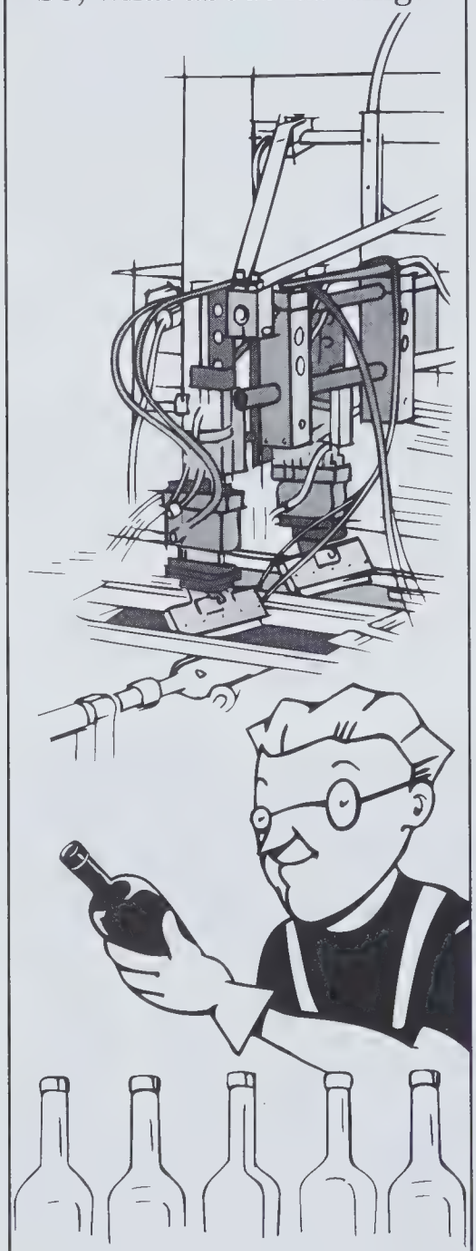

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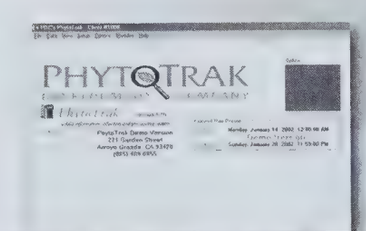

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VIEWPOINT

Microbullage at Bonny Doon Vineyard

BY Randall Grahm,
Bonny Doon Vineyard
Santa Cruz, CA

Microbullage, the French term for "micro-oxygenation," is a technique invented a little over 10 years ago in southern France in the appellation of Madiran by Patrick Ducournau. His primary goal was to tame the fierce Tannat grape.

Ducournau's neighbor, Alain Brumont of Chateau Montus, who at the time apparently had somewhat deeper pockets than Patrick and was able to afford barrels for his Madiran; and the passage of the wine through oak barrels seemed to have a somewhat salutary effect in taming the harsh astringency of the grape.

Ducournau thought that perhaps he might be able to emulate the effects of a barrel (at least its ability to exchange oxygen) without having to buy barrels. So he started playing around with administering oxygen directly into his tanks. There were a number of other people in France who had a similar idea at roughly the same time, and there are now quite a number of copycat *microbulleurs*.

As far as I can tell, Ducournau has been the deepest thinker on the subject, and it is something that he continues to refine. I used to go visit him while he was in the process of working out many of the details, and every time I saw him, he would tell me that everything he had told me previously was wrong. He is now definitely at a stage where he has had enough experience with micro-oxygenation to feel a lot more confident of how it works and how it is optimally applied.

Micro-ox is not an easy fix

Micro-oxygenation is not an easy, quick fix for your wine. In many respects, it makes your life as a winemaker far more complicated because it gives you a tool of infinitely shaded nuance. I tend to think of micro-oxygenation as the beginning of a journey for a winemaker. It can be used in a relatively safe and/or superficial way, or it can be used in a way that demands a lot more attention and skill. It can be used to great effect or it can be seriously abused. For me, if it is done properly, it becomes a sort of meditation that brings you closer to the wine.

Microbullage is micro-oxygenation, not micro-oxidation. It is a way of introducing a measured amount of oxygen into a tank of at least two meters in height, at a very controlled dose. This is accomplished by hooking up an oxygen bottle to the micro-oxygenation unit, which pulses oxygen at a very slow, virtually homeopathic rate into the tank through a slender tube that is attached to a ceramic diffuser sitting just off the bottom of the tank. The oxygen is metered in at such a slow rate that there should be no detectable dissolved oxygen in the wine.

The principle is simple. Young red wines need oxygen, some more than others. The "reductive" ones like Syrah and Mourvédre, Cabernet Sauvignon, and Tannat, need a lot; the more fragile "oxidative" ones like Grenache and Pinot Noir need substantially less. But they all need ***some***.

Instead of introducing the oxygen in what Ducournau calls "violent oxygen events," such as occurs in a racking, the

Micro-oxygenation equipment at Bonny Doon Vineyard

"Bonny Doon Vineyard is equipped to bubble roughly 29 tanks with fixed micro-oxygenation units, thus enabling us to bubble virtually 100% of the red wines produced on-site," explains Randall Grahm.

"We also have four portable units that we can move to off-site locations if that is required, or for *cliquage* in a smaller vessel or for barrel work (do not attempt this at home!). We also make some lots of red wine off-site, typically for 'Big House Red'; we have been able to perform *microbullage* on approximately 50% of those lots *en cuvaison*, and the final blend will generally spend some time with micro-ox in its *élevage* in tank.

"Micro-oxygenation is quite important to our wine style. While it is true that we are generally working with varieties that are not as tannic as the typical *bordelaise* (the grapes, not the people I'm talking about), the fact that we bubble enables us to enjoy longer macerations, and I think that this gives us greater depth in our wines.

"We like to work with lees, which seem to impart a certain savoriness to the wine; *microbullage* enables us to maintain a fairly high lees load in our wine during the ageing process without fear of untoward reduction.

"We are not so reliant on small cooperage, and for maintaining wine in larger wood vessels, micro-ox is a *sine qua non*."

wine receives essentially the same amount of oxygen, but more or less continuously. The winemaker is targeting a specific set of redox reactions, pertaining to the polymerization of tannins and anythocyanins. If you can target these reactions without giving the wine an excess of oxygen, you can theoretically retain a lot more fruit in your wine. In this sense, micro-oxygenation is the enological equivalent of minimally invasive arthroscopic surgery.

If you deprive red wines of oxygen when they are young, they will actually be more prone to oxidation later in their lives. While this is somewhat counter-intuitive, micro-oxygenation, when practiced properly, acts as a sort of innoculation against premature ageing of red wines.

Aims of the technique

- Treat problems of persistent reductiveness of certain grape varieties, such as one might find in Dolcetto, Aglianico, or Freisa.
- Create a lusher, rounder mouthfeel, softening the tannins, while intensifying the aromatic potential of a wine.
- Eliminate harsh or vegetative qualities in wine.
- Give the wine the precise amount of oxygen that is appropriate for its stage of development.

Micro-ox can enhance red wine

Micro-oxygenation in and of itself will not enable you to bring your wine to market sooner, neither is it designed to accelerate the ageing of a red wine. If practiced properly, it will actually enhance the reductive power of a red wine, thus potentially requiring longer maturation in the cellar. In an ideal world, micro-oxygenation would be practiced where there are not such rigorous deadlines for bottling.

What type of wines are appropriate for micro-oxygenation? To really optimize the technique, you need a certain concentration of both anthocyanin and tannin in the wine you are working with. High tannin and relatively low anthocyanin, such as one finds in Nebbiolo, will not work very well and can easily lead to formation of dry tannins.

Wines low in anthocyanin and tannin, such as Pinot Noir, are also problematic. You can add tannin to wines that are deficient, but what works best are grapes that are naturally rich in both tannin and anthocyanin.

Two phases of micro-ox

There are two essential phases of micro-oxygenation: the structure-building phase and the harmonizing phase. Structure-building begins when the wine has finished alcoholic fermentation and ideally before it has begun malolactic fermentation (MLF). It is important to create a little bit of acetaldehyde in this phase of the wine's life.

MLF activity tends to work against the efficacy of micro-oxygenation because it generates CO_2, and the CO_2 keeps solids in suspension. There are arguments for beginning the initial big dose of oxygen either on the skins or without skins, but the important thing is to begin it ***soon***.

At Bonny Doon, we typically work to inhibit MLF, at least in the early

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stages, through addition of higher levels (40 to 60 ppm) of SO_2 at the crusher and with the addition of 300 ppm lysozyme. We like to begin micro-oxygenation on the skins. Depending on the variety, we will begin with a dose of 20 to 60 millilters per liter per month (ml/L/mo) and continue that for seven to 14 days.

Ideally, you would want to de-gas the wine of CO_2 and make sure that it is relatively limpid. If the wine is turbid, micro-oxygenation will not work very well.

When we observe the MLF really kicking into gear, it might be an appropriate time to press off the skins. Alternatively, if we observe aldehyde formation that persists for any length of time, it might also be a good cue to press. Most important, if we observe the formation of drying tannin, it might indicate that our dose is too high.

The single most difficult aspect of micro-oxygenation is learning how to properly identify the character of the tannin in the wine that is being bubbled. With micro-oxygenation, you can theoretically transform hard tannins into softer tannins, but under no circumstances do you want to turn these into dry tannins.

During the structure-building phase, the wine may, in fact, sometimes seem to taste harder. This is a good thing. Ideally, if you know what you are doing, you will not panic and pull the plug on the oxygen at that point. Alternatively, if you are blithely oxygenating your heart out and generating dry tannins, this will go on the wine's permanent record.

After we have created a little bit of aldehyde (we are typically looking for aromas of chocolate or vintage port) and have pressed off the wine, we stop the micro-oxygenation and wait for the aldehyde to disappear. Then we simply observe which way the wine wishes to go. After the aldehyde has disappeared, we begin the bubbling again at a lower rate, typi-

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cally 3 to 5 ml/L/mo, and simply observe the wine.

I believe that what you are trying to attain is a certain balance point in the wine, where it is certainly not too "open" nor overly reduced — maybe sitting just on the side of "slightly reduced." This is called "surfing the reductive wave." Over time, you will need progressively less oxygen to maintain the wine at this balance point, and typically for long-term ageing, you will be holding the wine at somewhere between 0.75 and 1.5 ml/L/mo.

Probably well before this balance point, your wine will complete MLF, and most winemakers will probably think about adding SO_2. *Moi*, I am a relatively anti-SO_2 kind of guy, and my tolerance for VA seems to be getting stronger every year.

We try to delay the SO_2 addition for as long as we feel we can get away with it. Once you have added SO_2 to the wine, micro-oxygenation continues to work, but it will be far less effective at really changing the structure of the wine.

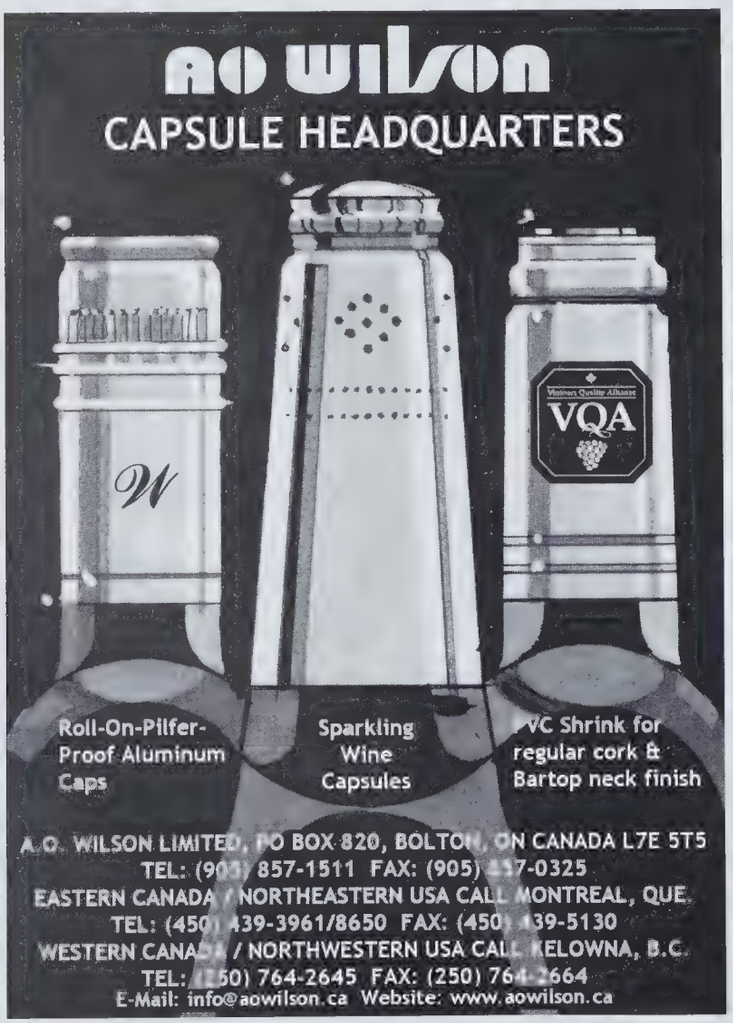
When the wine is going through the structure-building phase, it may (or may not) seem to turn thin, anemic, hard, metallic. This does not necessarily mean that you have trashed the wine; as long as the tannins are not dry, the wine should pass through this phase and ultimately begin to grow in body and volume. When it has reached its maximum potential of body and volume, the structure-building phase ends and the harmonizing phase begins. You will then notice some of the rougher edges coming off the wine as it grows into greater harmony with itself. (How's that for a Santa Cruz locution?)

One way of thinking about micro-oxygenation is that every day, or maybe every week, you are stating a hypothesis about where the wine is in its development and making a choice about how much oxygen to give it. At a certain point, you will conclude that the wine does not need any further oxygen to maintain its balance point. It is very important that you test this hypothesis and stop bubbling at least six to eight weeks before bottling to make sure that the wine is stable and will not take a reductive turn.

Wine temperature for micro-ox

It is also very important to consider wine temperature when performing micro-oxygenation. According to Clark Smith (Vinovation, Sebastopol, CA), the ideal temperature is somewhere between 59° and 65°F. But I believe that Ducournau and his colleague Thierry Lemaire initially like to hold the temperature higher, maybe closer to 75°F or even higher, while the wine is still on the skins.

The important thing to remember is that when you are bubbling, you are generally acting in a dynamic equilibrium. If you think of the oxygen as the "gas" to drive certain reactions, there are other factors at work that will act as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brakes. Typically, these are lees, suspended solids, the wine's natural reductive nature, and the push-back of the wine itself.

One serious caveat is not to bubble when the wine is too cold, because the oxygen is far more soluble and there is a greater risk of saturating the wine with O_2. If you are at a stage when you have already added SO_2 to the wine, the presence of dissolved oxygen in your wine is easy to detect as you will see the SO_2 level begin to drop.

Dangers of micro-oxygenation

I think that there are some very real dangers with micro-oxygenation. The chief hazard is over-doing it. I joke sometimes that, with micro-oxygenation, my mantra is "I will fear no tannin."

I think that micro-oxygenation has perhaps emboldened me to try to extract more out of grapes. In some cases this can be a very positive thing, but if a wine is over-extracted and then bubbled at a high rate to tame this tannic monster, there is then a much greater risk of overdoing it.

Over-bubbled wines, in addition to having a drying sensation, can taste a little bit jammy or pruney, almost as if they have been stewed. If practiced correctly, you should be able to keep a lot of sharp definition in the wine.

You will not master micro-oxygenation overnight. It takes a few years and a lot of attention to do it properly.

Practice micro-oxygenation slowly

Whatever you do, I would recommend going into the practice slowly until you get more comfortable with it. One hundred percent micro-oxygenation of all red wines is not the right answer for everyone.

Many wineries use micro-oxygenation only during cuvaison (primary fermentation) and will then press the wine to barrel. I think that this makes sense for any large winery that is holding any of its wines, either red or white, in large tanks for any length of time.

The irony of micro-oxygenation is that it works especially well for wines that really don't need it all that much. Winemakers in California can generally gloat about the phenological maturity of our tannins.

Conclusion

What micro-oxygenation allows us to do is turn up the volume on our wines. While this can be very attractive to certain influential wine publications, I'm not sure that it is necessarily in the best spiritual interests of the winemaker.

Micro-oxygenation is not just a winemaking technique; it can be a profound form of vinous meditation. ■

This article is adapted from the author's presentation at the Unified Symposium in Sacramento, CA, January 2003.

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Twists and turns: wineries retool for screwcaps

BY Tina Vierra

Unlike cork closures, no research exists on whether screwcap closures are suitable for bottling wine for long-term ageing. Yet.

Wineries in other countries have experience with bottling in screwcaps for some time now — Switzerland, Germany, France. But they have been using screwcaps for short-term wines, meant to be produced inexpensively and consumed young. Producers have had little interest in holding such wines and documenting the performance of screwcap closures for the long term.

It may be that Australia and New Zealand will provide the best-documented science on the subject of screwcap performance. Wineries there have jumped into screwcap closures in a big way. A coalition of screwcap-friendly New Zealand Sauvignon Blanc producers will bottle all of their 2003 vintage in screwcaps. Thirty million screwcap closures were used on premium, super-premium, and "icon" wines in Australia and New Zealand in 2002.

In May 1999, the Australian Wine Research Institute (AWRI) implemented a study of multiple closure types and brands in order to measure their short- and long-term performance. Among the types are ROTE (roll-on tamper-evident) screwcaps. The wine is a Semillon bottled at a commercial facility under controlled conditions. Wine composition was outlined and measured at the time of bottling. It included 30 mg/liter free SO_2 and 95 mg/liter total SO_2. Table I shows the free and total SO_2 levels at 24, 30, and 36 months after bottling.

The ROTE closure is scoring low for oxidation and browning, and in sensory evaluations, the wine is evincing "citrus" and other fruity characteristics. But it is also showing a low-level reductive character that the scientists are describing as "rubber-like" or "struck-flint." The study notes do not mention if this is an undesirable characteristic.

Full testing data are being made available to worldwide grape and wine entities as each round of testing proceeds. Results are being reported in journals, such as the *Australian Journal of Grape & Wine Research*, ***PWV***, and at trade conferences, such as the Unified Symposium. The trial is expected to run for 10 years, according to its authors, Peter Godden *et al*, of AWRI. Contact information is provided at the end of this report.

Table I. Mean SO_2 concentration following 24, 30, and 36 months of storage in an inverted position. ***(n=number of samples tested)***

		24 months inverted storage (n = 20)[a]	30 months inverted storage (n = 8)[b]	36 months inverted storage (n = 20)[c]
Aegis	Free	8 (2)[d]	6 (1)	6 (2)
	Total	67 (3)	59 (4)	58 (6)
Altec	Free	18 (2)	16 (1)	17 (2)
	Total	83 (2)	81 (1)	83 (3)
Auscork	Free	10(2)	8 (2)	6 (2)
	Total	69 (4)	64 (5)	63 (5)
ECORC	Free	5 (2)	5 (1)	4 (2)
	Total	57 (6)	55 (3)	47 (5)
Integra	Free	9 (2)	6 (2)	5 (2)
	Total	67 (3)	60 (4)	59 (6)
Nomacorc	Free	9 (2)	6 (1)	6 (2)
	Total	68 (3)	63 (2)	62 (4)
NuKorc	Free	11 (1)	9 (1)	9 (3)
	Total	72 (1)	68 (3)	67 (3)
One plus One	Free	14 (2)	14 (2)	12 (2)
	Total	77 (3)	76 (2)	75 (4)
Reference 2, 44mm cork	Free	13 (4)	12 (4)	9 (4)
	Total	75 (8)	73 (7)	67 (9)
Reference 3, 38mm cork	Free	11 (2)	9 (3)	8 (3)
	Total	71 (3)	66 (6)	67 (9)
ROTE	Free	19 (3)	17 (3)	17 (4)
	Total	85 (5)	81 (5)	84 (5)
SupremeCorq	Free	9 (2)	7 (1)	6 (2)
	Total	66 (4)	62 (3)	58 (5)
*California "Tage"	Free	5 (1)	3 (1)	4 (1)
	Total	54 (4)	47 (6)	47 (5)

[a] n = 36 for the ROTE closure; n = 14 for *California "Tage" and ECORC closures
[b] n = 12 for Ref 2, Ref 3, and One plus One; n = 4 for ECORC and California "Tage"
[c] n = 28 for ROTE; n = 14 for ECORC and California "Tage"
[d] Figures in parentheses are standard deviations
Source: Australian Wine Research Institute

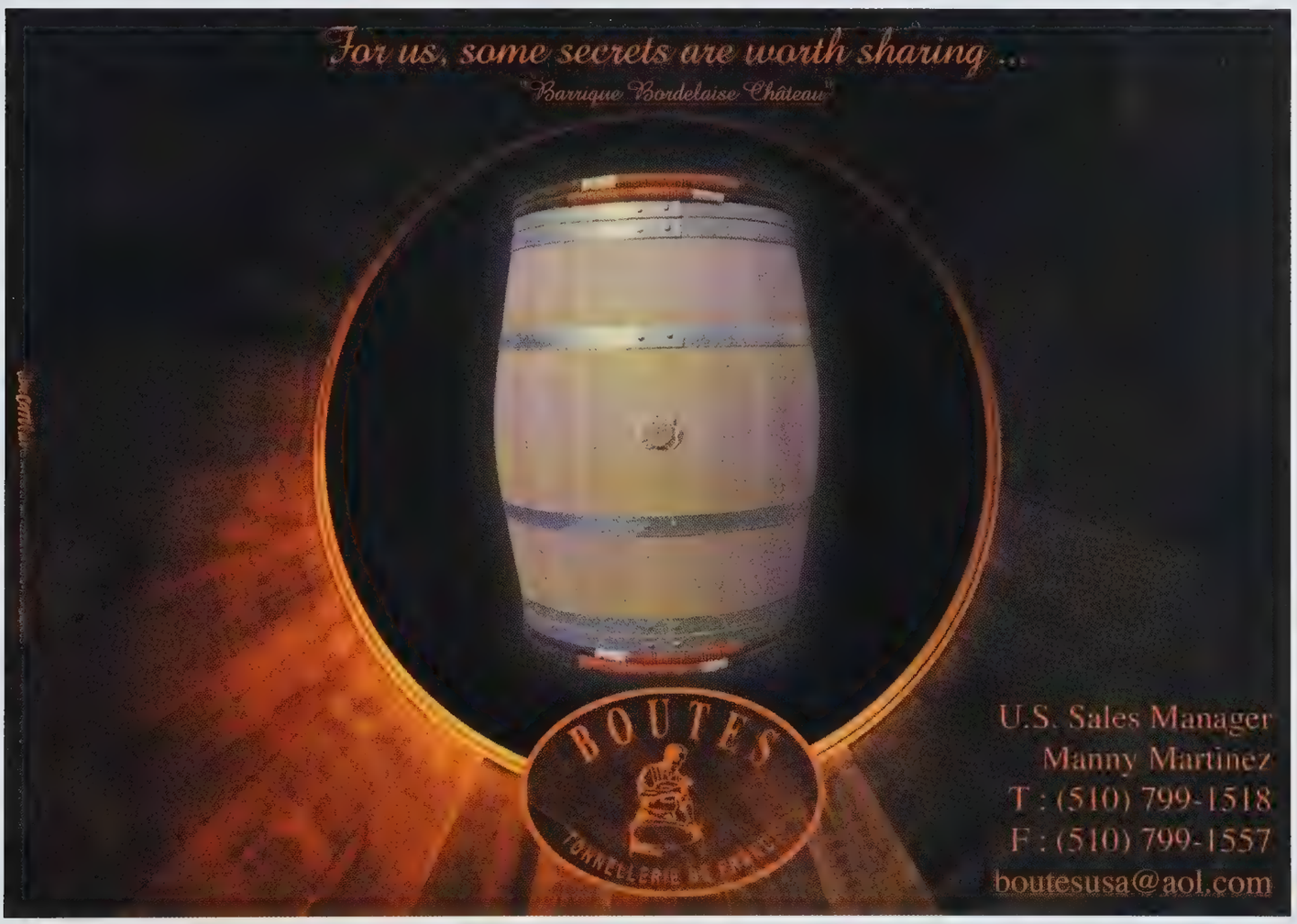
Editor's note: The Tage closures used in the AWRI study are not Novembal-produced closures but were obtained through Esvin Wine Resources in New Zealand, and made by a California manufacturer.

Downing Family Vineyards' 2001 Zinfandel in both cork and screwcap packaging.

Closures and Bottles

With North American wine industry buzz building into actual business in screwcap production, closures and corresponding bottle finishes are now available from several U.S.-based distributors. Screwcap dimensions are becoming standardized at 30mm diameter and 60mm skirt length, with a bottle thread finish (BVS, BVP or SLP), which will reduce production costs, and make machinery tooling easier. Wineries can custom-design finishes if this new standard doesn't suit their package design, though.

"Stelvin is one of the oldest and most widely distributed wine screwcap closures," says Etienne Moly, sales and marketing manager for Pechiney Cork & Seal (American Canyon, CA), Stelvin's manufacturer. Moly has worked with many screwcap customers in the U.S. and provides detailed specifications for Stelvin to bottle suppliers and machinery fabricators, as a winery develops its screwcap packaging.



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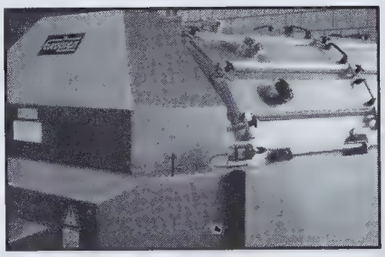

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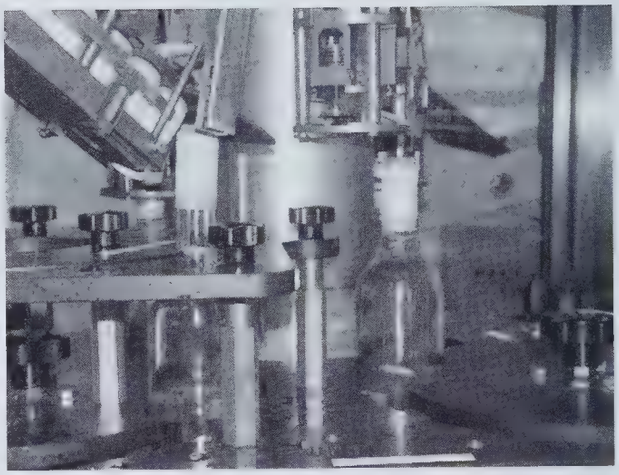

Murphy-Goode's new monobloc bottling their "Tin Roof" screwcap Sauvignon Blanc.

The Stelvin was developed specifically for still wine use with a choice of two proprietary liners. The Stelvin requires a pressure block to shape the liner to the glass finish, which should be considered when buying or retooling capping machinery.

Many screwcaps, such as those from Globalcap (distributed by APM, Benicia, CA), are offered with a choice of liners (the sealing disc of material inside the cap). Companies like APM and G-3 Enterprises (formerly Midcal Packaging, Modesto, CA) carry both bottles and screwcaps in their product lines, while other glass producers, such as Demptos and Saverglass, work in tandem with the screwcap producer to match screwcap to bottle finish. *PWV* found no preference among the wineries contacted for this report.

"Customer demand prompted us to start offering screwcap thread finishes," says David Schwandt of Demptos Glass (Fairfield, CA). "Interest was getting stronger in the U.S. We started bringing in bottles from Europe that are being supplied to Australia and New Zealand — finishes with a track record."

Saverglass (Napa, CA) supplies bottles for spirits with BVP and SLP closures (BVP and SLP are terms for screwcap thread finishes). In 1999, Saver developed a BVS (*bague verre stelvin*) finish to support the Stelvin screwcap for the Australian market, and by 2002, was bringing the bottles into the U.S. and other New World markets. While the 30x60 screwcap is becoming the most widely available, Erica Harrop (Saverglass) says other dimensions are possible.

"What is important is that the winery understands that the bottle determines the length of the screwcap skirt," explains Harrop. "The length of skirt is not interchangeable on a bottle, as there is a specific measure on the bottle to make the screwcap fit properly.

"We can produce all sizes to accommodate all screwcaps made, and are trying to keep the look unique to every packaging manager. Any shape bottle works. The finish has to be 30mm across, and the length of the neck very exact, down to 60mm. You cannot have a very straight neck, or one that flares too much."

Demptos Glass offers three options in Burgundy-type bottles and three in Bordeaux-type, all 750ml. "A few others are in development," says Schwandt. "A Burgundy DLG bottle is available from stock, and more styles and colors will be stocked in the future as demand grows. We stock bottles in our warehouse, so wineries can avoid the long lead times and large minimums associated with bottle production runs."

The glass companies work closely with machine companies and producers to take all aspects of the screwcap package into account. "When wineries first come to us in the planning stages, they want to understand the technology behind the closure," adds Harrop, "application of the cap, the top pressure, and choice of liner.

"How to dose with gas — the Australians call it a 'snow drop' — to evacuate oxygen is critical. I've heard comment that, if a winery is not addressing the application correctly and does not create a proper seal, this will bring oxygen uptake into the wine.

"The screwcap is a very precise closure, unlike natural cork, which forms to whatever shape a bottle neck may have. It is important also to put inert gas in, since it is not yet possible to pull a vacuum. It is too easy to imagine this package is as forgiving as cork, but it is a more complex product and needs to be treated with respect. Then it will perform with very high marks."

Both Schwandt and Harrop see the screwcap trend as sluggish in the U.S. so far, but not for lack of interest. "We're seeing small-lot wineries order a few thousand cases. Some very large wineries are test-marketing screwcap-specific brands," says Schwandt. "Compared to the market and the talk going around, solid orders are conservative so far. But they're taking what finishes are available and asking for broader offerings in the future."

"Every winery has an *interest*," reports Harrop. "This packaging trend has not settled down yet, and I think that acceptance in various markets is still to be explored. It certainly fits well with those high-end wines that are fresh and fruity and want to retain those attributes. Considering how many very great wines are consumed in the first five years, this is a tremendous closure."

Machinery options

U.S. wineries are playing the wait-and-see game before buying new machinery to bottle with screwcaps. Bert Loughmiller, president/CEO of APM, has seen various machinery options. "For the moment, most wineries are improvising production by hooking up with someone who already has application equipment that they can easily convert to apply screwcaps.

"As these and other first-time winery customers think about obtaining their own capability, their equipment options depend on how much flexibility they need in the future. For instance, a small producer might choose a free-standing hand-operated capping machine. For them, no change is involved."

If wineries have a bottling line and wish to integrate screwcapping into it, they could insert an automated capper into their line, just the way they would do with a capsule applicator or a corker.

A three-head Bertolaso Italian screwcapper was installed at Murphy-Goode Winery (Healdsburg, CA) and also at Napa Wine Company (Oakville, CA) in the spring of 2003. Scott Laboratories distributes a machine from MBF Bottling that Bonny Doon Vineyard installed in 2002. Mobile bottlers have yet to see enough demand for retooling or buying new machinery.

WINERIES USING SCREWCAPS — *Downing Family Vineyards*

Stuart Winkelman, general manager of Downing Family Vineyards (Napa, CA), is one of the American wine industry's biggest cheerleaders for screwcaps. Downing's website (www.dfwines.com) contains many pages of educational data and links to more data about the benefits of screwcap closures. It's a good resource for wineries and consumers interested in the subject.

Winkelman notes the Australian closure studies and some limited earlier research as influential to Downing's decision to try screwcaps. They were

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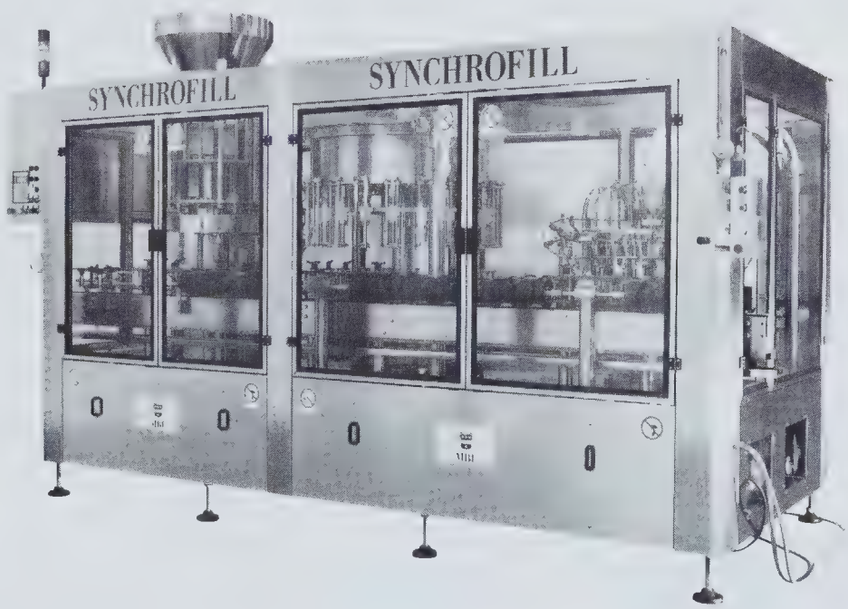

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frustrated with their cork program, going so far as to find and buy the highest quality cork available, in the longest lengths for both appearance and quality control. They then had to toss out the bottom 30% of the corks they tested in pursuit of even tighter QC. "I've spent a lot of time researching corks. We have cork problems just like everyone else has cork problems," reports Winkelman.

Downing Family Vineyards developed its first screwcap package, a lucite mock-up bottle, to test on the public at

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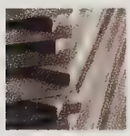

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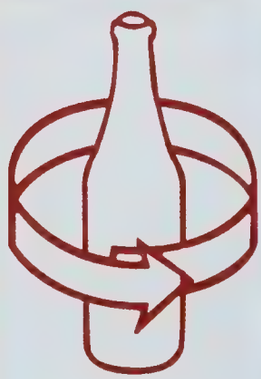

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the January 2000 Zinfandel Advocates and Producers (ZAP) tasting in San Francisco.

"This was in the days when we had a hard time getting a bottle made up. The glass companies weren't behind screwcaps with the finishes just yet. We used Vetri Speciali, who really pitched in and worked with us on mock-ups for the look we wanted. Plus, we'd been using long corks and long skirts on the capsules as part of our packaging. So to match that look in our screwcap, we got the longest skirt finish possible on the Stelvin and the bottle," recalls Winkelman.

Downing is on its second vintage of screwcapped Zinfandel now, and since they didn't have the equipment to do it, have bottled their screwcap packages by hand. Even though only 30% of the small winery's total production has been hand-bottled in screwcaps — 420 cases last year — Downing met supplier minimums and bought 50,000 screwcaps and over 18,000 bottles.

Since Downing custom-crushes at Napa Wine Company with winemaker Randy Mason, this year they'll use the new Bertolaso screwcapping machine on the smaller of two bottling lines there. "We'll have to buy them all lunch to say 'Thank you!'" says a relieved Winkelman.

The only potential problem to study will be the machine heads' compatibility with Downing's unusual screwcap. It's 31.5 mm across the head, unlike the mostly standard 30mm. Since they have tens of thousands of the screwcaps on hand, Winkelman hopes the machinery can be adjusted to work with their package.

Napa Wine Company

A large custom-crush facility, Napa Wine Company added a Bertolaso screwcapping machine to accommodate customers who want to bottle with screwcaps.

"For some time now, we have been helping some of our clients with this type of project. So we chose to purchase the equipment necessary. We feel that there will be a segment of the wine industry that will select this type of closure," reports Sheldon Parker, Napa Wine Company general manager. "We were planning to upgrade our second bottling line to run at about 80 bpm. We saw this as an opportunity to incorporate a screwcap machine at the same time."

Parker has the background to understand this type of closure. "Some 20 years ago, I had a lot of experience with ROPP (roll-over pilfer-proof) closures. Although it is a bit of a different style, the principles are the same. The roll-down adjustments at the thread, known as 'side pressure' and 'head pressure,' are critical. Testing during production has to be constant and carefully monitored."

Of the roughly one million cases per year produced at Napa Wine Company, 40,000 cases will be screwcap wines in 2003.

WillaKenzie Estate

WillaKenzie Estate (Yamhill, OR), bottled 15% of its 2001 vintage wines with screwcaps in 2002. (Total production was just over 18,000 cases.) Varietals include Pinot Blanc, Pinot Gris, Oregon Pinot Noir, and Estate Pinot Noir. Winery owner Bernard Lacroute and previous winemaker Laurent Montalieu researched the various alternative closures for two years before deciding to test with screwcaps.

"Our reason for using screwcaps is that we are convinced that they are the best technical alternative to traditional corks, which have been causing a defect in wines at the rate of between 5% and 10% worldwide due to contaminants found in the cork," reports Michael Osborn, general manager. "This is exactly the problem that we are solving with the screwcap."

Winemakers keep free SO_2 levels at bottling at 25 ppm for red wines, and 30 ppm for whites. They are keeping a library of the screwcap-bottled wines for

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internal testing. Osborn reports "no negative or surprising" findings.

WillaKenzie is using Alplast closures from Italy, chosen for a long history of success with Italian producers. They worked to develop a screwcap package as similar as possible to their cork bottle package. "This is an issue of preserving the brand identity and the image that we want in the marketplace. We believe that we have achieved our objective, as the cork and screwcap packages appear nearly identical."

The winery was able to lease a screwcapper from a local equipment supplier as it tests the waters with screwcaps. "It works very well with our existing bottling line," Osborn reports. "Overall, the time spent bottling is pretty much the same for screwcaps and corks. We are currently evaluating the alternatives of adding the screwcap machine to our existing line or selling it and replacing our equipment with a new unit, that will do corks or screwcaps."

Rex Hill Vineyards

Another Oregon winery experimenting with screwcaps is Rex Hill Vineyards (Newberg, OR), which bottled 3% of its 2003 production in screwcaps in late April. Total screwcap production was 492 cases of 2002 Sauvignon Blanc ($12), 358 cases of Rosé of Pinot Noir ($14), and 24 cases of 2002 Viognier ($24).

They plan to sell most of the screwcapped wine in their own tasting room where they can educate customers and monitor its reception closely. Jeff Palmer, sales and marketing vice president, looks forward to the closures being a hit both in the tasting room and in restaurants, where he also hopes the wines will do well.

"I've had wine at the end of a workday culled from open bottles in the tasting room and found it corked," he says. "This means that perhaps 10 to 20 customers and our own people smelled and tasted this wine and thought this was the way it tastes. I was horrified. My number one goal now is that people attribute the taste of the wine to the winery and *not* to the closure."

Winemaker Aron Hess used the same mobile capping machine as WillaKenzie, from M&D Specialties, an Oregon machine distributor. With expert help from Mike Aplin at M&D, he set the capper and his own bottling line carefully for the screwcapping process. "We set the filler very precisely for a 750 ml fill height, when normally I'd set it looser, maybe 752 or so. We wanted a very small headspace. We sparged with nitrogen to keep the dissolved O_2 low," he reports.

Aplin bought the GAI machine with a Technovin head for Stelvin caps in 2002 to begin servicing Northwest wineries asking about bottling capabilities in screwcaps. His machine is doing a growing amount of traveling around Oregon as more wineries give screwcaps a try.

From Aplin's viewpoint, tight controls at bottling are what make the screwcap process work effectively, and he counsels customers on glassware, screwcaps, liners, machine heads, sparging, fill height, and whatever else he learns about along the way.

"I'm no winemaker, just a machine guy but I hear a lot around the bottling line each time I take the machine out and help set up to do this," Aplin adds.

The Rex Hill Rosé has a high pH of 3.6, and was bottled with 33 mg/L free SO_2. With a pH of 3.2, the Sauvignon Blanc was bottled with 25 mg/L free SO_2. Hess is monitoring the wines bottled in screwcaps this year very closely in hopes that next year, he can be less conservative and bottle even more wine in screwcaps successfully.

Cornell University experimental winemaking program

In 2003, all wines in the experimental program at Cornell's school winery (Geneva, NY) will be bottled with screwcaps.

"We will bottle approximately 200 cases of wine this year," says Luann Preston Wilsey, winemaker for the program. "About one third of these wines will be hybrids from the New York State Agricultural Experiment Station grape breeding program. The remaining wines are *vinifera*, including Chardonnay, Pinot Noir, Riesling, Cabernet Franc, and Cabernet Sauvignon. They are used to evaluate vineyard trials and vinification methods and to compare vintages."

The school cited minimal oxygen diffusion, lack of off-flavors found from other closures, and more consistent integrity as the factors that led them to use screwcaps. APM generously donated an off-the-shelf, single-head spinner unit, the screwcaps, and bottles for the program, and sent a technician to do the installation and minimal training required.

Loughmiller of APM describes the basic operation of the spinner. "A screwcap is slipped onto the neck of a bottle and then the bottle is placed on the cylinder. The safety door is closed and the spinner is activated. The spinner head gets lowered down onto the screwcap. Inside the spinner head are small metal wheels that are pressed against the outside of the screwcap, thus forming the screwcap onto the bottle.

"The operation is a bit like an electric pencil sharpener. But instead of sharp cutting metal pieces, you have smooth rolling wheels. The spinner also performs one other critical operation. It pushes down on the top of the screwcap with a specially designed pressure block. This forms a tight seal between the metal and glass by locking down the liner.

"Around the outside of the head are small bolts that control the range of motion and the forces that the forming wheels apply to the screwcap. During normal operation, it can be necessary to occasionally make small adjustments to these bolts in order to get the best possible results. This is an operation similar to what winery line mechanics do with all bottling equipment. A little training gets them the basic skill, then trial-and-error teaches them the subtle skills.

"In getting started, a screwcap spinner head is delivered with factory settings. The head is slipped onto the spinner shaft and locked in place. It is ready to go, but a technician generally should be present to verify the setup and offer minimal training. After extensive use, typically measured in years, normal wear and tear will make it necessary to have major service performed. Again, this is similar to other winery equipment. Most commonly, this would involve the head being returned to the manufacturer to be rebuilt."

Cornell does not sell its wines commercially; it produces and bottles them for research only. The screwcap closures will be closely monitored for performance. Chemical integrity of the wines, oxidation, and other factors will be monitored by students and

instructors in the winemaking program.

Murphy-Goode Winery

Murphy-Goode Winery sources Sauvignon Blanc from several areas in Northern California. Seeking to distinguish its Alexander Valley "home" fruit from other Sonoma and Lake County grapes with different flavor profiles, the winery separated the brands, putting the Sonoma and Lake County wines in new packaging with synthetic closures in the mid-1990s.

David Ready Sr., head of the winery's sales and marketing forces, reports they were happy with synthetics early on, but the longer the wines were in bottle, the less satisfied they became. "We went back to traditional cork," he says. "But our results were consistent with the rest of the industry."

Bonny Doon used bold necktags to educate consumers on the winery's use of screwcaps

Ready Sr. and his marketing team watched the industry worldwide. They got turned on and educated by the fun, ingenious work at Bonny Doon to turn consumers onto screwcaps, and by what they were seeing in New Zealand with so many producers putting many Sauvignon Blancs into screwcaps there. "We were feeling like there's no risk to trying it," Ready Sr. says.

At sales meetings, talk of a fourth Sauvignon Blanc brand, this time in screwcap packaging, was floated. One team member joked about sales of such a brand funding the new tin roof he'd just put on his backyard Tiki-bar, and the brand name and identity were born. Twelve thousand cases of 2003 Tin Roof Sauvignon Blanc were bottled in April 2003.

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At first, Murphy-Goode looked for custom crush facilities, sought out mobile bottlers, and even called Bonny Doon, hoping to bottle the first vintage of the brand without buying new equipment. They borrowed a spinner from Pechiney and did a trial bottling of Chardonnay in 2002, but discarded the trial as unrealistic.

David Ready, Jr., winemaker, decided that since the winery was only one year away from investing in a whole new bottling line anyway, they would go with a screwcap line for 2003. A 25/4/3 Bertolaso monobloc line saved the winery money by incorporating a filler, corker, and 3-head screwcapper in one block. Murphy-Goode is the only winery in California, he believes, with a 3-head Bertolaso spinner for screwcapping.

"We chose Bertolaso for their long history of machinery, and I went to Italy to do the homework. We put in a McBrady orbiter because I wanted lower O_2 pickup, quality bottling, but at speeds up to 100 bpm, so we had to upgrade the orbiter," says Ready Jr. The Readys estimate that the new bottling line will pay for itself in two years.

Murphy-Goode is using Stelvin screwcaps, but Ready Jr. has other brand samples and plans to try them side by side. Due to some of the usual headaches of supplies coming from France, lead time for overseas shipping, and artwork delays in the packaging, he will have had his chance to try other screwcaps when he bottles a second lot of 8,000 cases in June.

He plans to keep samples of the Sauvignon Blanc, and some reds, in every closure — cork, various screwcaps with foam and tin liners — and will do in-house testing to see what best serves the winery's purposes.

"We are tracking the SO_2 level in the bottled wines," Ready Jr. notes. "I used the free SO_2 as a benchmark measurement in our synthetic cork trials as well. With the white wines I am aiming for 0.8 molecular free SO_2. In the reds, I am generally aiming for 30 to 35 ppm free SO_2, but it depends on the wine. We get a measurement prior to bottling and then check the SO_2 as we go.

"I hear a lot of confusion from winemakers. That the wine won't get any O_2 and won't develop, or that it will get too much as with some synthetics. So we had to ignore the confusion and see for ourselves what will really happen." Choosing Sauvignon Blanc, making it in a fruit-forward, drink-now style, in quantities and with supply lines for quick sell-through, means ageing won't be an issue for this particular wine in screwcaps.

Bonny Doon Vineyards

No report on screwcapped wine would be complete without Bonny Doon Vineyards (Santa Cruz, CA). By 2004, the winery hopes to bottle every still wine it makes with screwcaps.

Dave Jankowski in winery operations was instrumental in the machinery retooling for screwcaps. "We chose the Capmatic screwcap machine by MBF [Italian machinery distributed by Scott Labs], who built our Synchrofill rinser, filler, corker monobloc," he says. "I visited their plant in Italy in 1999. Randall [Grahm, Bonny Doon winemaker]'s idea to screwcap Big House Red was given to us in operations in late 2001. We started up our Synchrofill line in 2001 and then added the Capmatic screwcapper in June 2002.

"I met with MBF at the Unified Symposium and explained that we wanted the screwcapper to work in synch with our monobloc filler. We have a somewhat compact line. Because of space constraints, we had to position the screwcapper as close to the filler as possible.

"It's really important to have the two independent machines working together when they're in close proximity (the screwcapper sits only 10

feet downstream from the filler). This took some conveyor reconfiguration, but it has worked out very well.

"Initially, I asked MBF to work on a screwcap delivery system that would apply the screwcap as the bottles came off the filler. But we agreed that the screwcap would have to be applied at the screwcapper. Again, we were limited by space.

"You have to be able to access everything on the line. After the bottle is filled, it moves down to the screwcapper. Just before capping, two nozzles blow nitrogen — one into the bottle and the other up into the screwcap. The leading edge of the top of the bottle catches the screwcap and pulls it from the magazine. After that, it swings through the infeed wheel and gets 'rolled' down by the screwcap heads. Done."

Jankowski finds that O_2 pickup with the screwcapper is minimal, and usually related to a low bottling tank. Experienced with natural cork and Supremecorqs, Jankowski claims any O_2 pickup at bottling is in the same ballpark with the other closures.

Asked if he encountered any tricky packaging issues, Jankowski reports that Pechiney helped the winery coordinate with the glass and machinery manufacturers.

"Stelvin has a specific 'thread mold' so when you source the glass, it has to be with that specific thread pattern. That's also a key issue when a screwcap machine is built. The manufacturer has to know the thread pattern so that the rolldown heads follow the thread. The cap itself has no thread on it — it's the small, horizontal metal disks on the machine heads that 'bend' the capsule around the bottle's thread," he notes.

Alison Crowe, Bonny Doon associate winemaker, reports that the winery has plotted an in-house program for tracking performance of their wines in screwcaps. "Our current QC plan is to pull two bottles from the line every hour. These are checked for free SO_2, dissolved oxygen, and fill height. We also pull three samples per day, labeled with dates and time, for microbial analysis. In the middle of the run, a full case is pulled and stashed away for future tasting and analysis."

The new bottling line gives winemakers dial-control over the fill height. With the nitrogen sparging described by Jankowski above and controlled fill height, they don't have to worry about pulling a vacuum and yet still find dissolved oxygen pick-up is the same or less than with previous closures.

Calera Wine Company

Proprietor Josh Jensen of Calera Wine Co. (Hollister, CA) has produced Viognier under his Mt. Harlan label from California central coast vineyards since 1978. Jensen is either taking a big risk by putting his 2002 vintage into screwcaps or saving its reputation, depending on your viewpoint.

Inspired while in Australia in 2002 speaking with screwcap wine producers there, Jensen rented a single-head GAI screwcapper from AWS (Windsor, CA) and bottled half of his 2002 Viognier with screwcaps.

"It's a benchmark wine, and we really want our customers to believe screwcaps are a viable option," says Diana Vita, winery manager at Calera. "It took extra personnel to do the bottling. We brought the AWS capper next to our line, (which is also GAI machinery from AWS/Prospero) pulled the bottles off the conveyor for screwcapping, then put them back onto the conveyor for labeling. But we got it all done in one day, and it will be worth it."

Free SO_2 at bottling was high because the wine had only just finished malolactic fermentation and was not quite stablized yet; about 35 mg/L. Calera usually bottles its Viognier on the high side between 25 and 30 mg/L. Winemakers expect the screwcapped Viognier to reduce in bottle and are comfortable with the free SO_2 level.

One thousand and seventy six-pack cases of the Calera 2002 Viognier are available in screwcaps and approximately the same amount bottled with corks. Both will retail for $36.

Clos Pegase

Before the traveling GAI screwcapper went to Calera, it was at Clos Pegase in Calistoga, CA. Winemaker Shaun Richardson, who hails from Melbourne, Australia, convinced proprietor Jan Shrem to bottle all 2002 Sauvignon Blanc (12,000 cases) in screwcaps this year. Using the same bottling procedure as Calera, Richardson's team took two days for bottling.

Cellarmaster Mark Bartlett found they didn't even need to sparge the headspace. "We did an O_2 level on an early bottle in our lab and found it very low, so we didn't bother." Free SO_2 at bottling was a low 22 mg/L, and the winery will be monitoring sample bottles.

Richardson reports that the Sauvignon Blanc has already shipped to the winery's nervous but game distributor, and to wine club members, some of whom called to report that their bottles didn't have any corks.

Bill Pregler, the AWS sales manager who's been renting out the GAI screwcapper around California this year, says interest piqued when he demonstrated the screwcapper at the Unified Symposium in January. The unit sells for about $25,000

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but AWS has been willing to rent it out while wineries decide whether to commit to screwcaps.

"I took some of the Clos Pegase Sauvignon Blanc home with me after they finished," he reports. "My wife tried it and loved the closure so much, she told me to take the corkscrew away and use it as a fishing lure from now on."

Marketing aspects

Armed with a solid brand concept from the very first sales meeting about the "Tin Roof," Murphy-Goode's sales force

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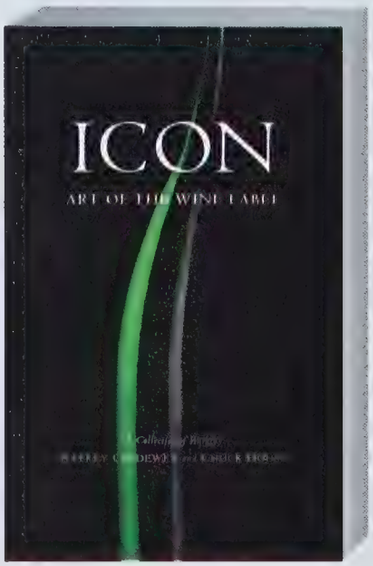

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Rolco International, Inc

Rolco builds carton balance systems which are accumulators used to balance the flow of cases between the uncaser and the casepacker on a bottling line. The unit shown on the front cover was designed for Robert Mondavi-Woodbridge (Woodbridge, CA) and readily accommodates all case sizes.

The accumulator unit is modular in design and the size and capacity can be easily altered to fit smaller or larger applications. Each product carrier (horizontal carriage) is designed to accommodate 11 or 12 empty cases, depending on the case size being run. The groups of cases are progressed through the accumulator, to the opposite end of the machine, where they are discharged onto the casepacker infeed conveyor.

If the casepacker is temporarily down, the cases will not be discharged and the unislide carriage will slowly descend downwards as groups of cases continue to be received from the uncaser. As soon as the casepacker is running again, the cartons will be discharged at a faster rate then being received, depleting the accumulated cases. Likewise, if the uncaser is temporarily down, previously accumulated cases will be discharged to keep the casepacker operational.

Brand changes are accommodated very easily because the Rolco Accumulator operates on a first-in, first-out principle.

Rolco International also designs and manufactures a variety of other case accumulators, including mat top systems, first-in, last-out serpentine systems and tower units.

For more information, contact:
Rolco International
Todd Fellner
2424 Progress Ct., Neenah, WI 54957
tel: 920/729-6381, fax: 920/729-5906
e-mail: toddfellnerl@rolcoint.com
website: www.rolcoint.com

Gordon Graphics

Gordon Graphics, using modern technology and state-of-the-art equipment, has endeavored to skillfully work with both wineries and designers to successfully produce those "difficult" labels that sell wine.

In addition to sheet-fed, glue-on labels, Gordon Graphics has waterless offset *roll label* capabilities coupled with foil stamping, embossing, die-cutting, and protective coating (all in-line) to produce the finest pressure-sensitive labels available.

Gordon Graphics welcomes your inquiries about how its combination of experience, personnel, and equipment can best serve your label needs.

Visit www.gordongraphics.com for more information about the company's label production.

For more information, contact:
Gordon Graphics
15 Digital Dr., Novato, CA 94949
tel: 415/883-0455; fax: 415/883-5124
e-mail: sales@gordongraphics.com
website: www.gordongraphics.com

PLEASE SEE THE GORDON GRAPHICS AD, PAGE 44.

Cover Photo

The Rolco accumulator at Woodbridge Winery (Woodbridge, CA) is 44 feet long, 18 feet wide, and 20 feet tall, with a storage capacity of 1,800 cases. The unit helps the bottling line achieve a speed of 380 to 390 1.5L bottles per minute. Woodbridge Winery has changed from a flange bottle finish to a bartop in 2003.

Demptos Glass

Demptos Glass offers over 300 wine bottle options from economically-priced standard shapes to ultra-premium heavyweight and specialty wine bottles.

New bottles include three Burgundy 750ml, three Bordeaux 750ml Stelvin finish styles, and 15 new 750ml cork finish styles. To view one of the new bottles, call one of the sales contacts listed below and make an appointment to visit Demptos Glass' Napa or Fairfield, CA showrooms.

Demptos Glass has numerous styles and shapes in stock in its' Fairfield distribution center to help wineries avoid long lead-times and large production minimums required by bottle production runs.

For more information, contact:
Demptos Glass
2300 Cordelia Rd., Fairfield, CA 94534
website: www.demptos.com
David Schwandt, Director of Sales & Marketing; tel: 707/718-4176
Julie Durkey, Sonoma and Mendocino counties; tel: 707/718-4175
Phil Jones, Central Coast and Sierra Foothills; tel: 925/360-6884
Jim Gleeson, Napa and Lake counties, NW States; tel: 707/718-4174
Midwest and East Coast
tel: 502/394-9298

PLEASE SEE THE DEMPTOS GLASS AD, PAGE 33.

Etched Images

Etched Images, located in Napa Valley, deep etches and paints wine bottles with your logo, label, or message. Precise processing assures your bottle makes a lasting impression, whether for winery label reproduction to give you a marketing advantage, or as a corporate gift.

Etched Images provides excellent turnaround time and competitive pricing to suit any project.

Other services include:

- Bottle blackening (dummy bottles).
- Sealing/dipping wax: NoChip Dip, for a distinctive wax-like dip finish with 14 stock colors (including metallics) and custom color blending.

ETCHED IMAGES

- Small-run, full color, die-cut vinyl wine labels that apply easily to wine bottles and wood box lids.
- Wine bottle/wine glass wooden boxes. Clear pine box with rounded edges holds one, two, or three .750-liter bottles. Your artwork, logo, or message can be laser-engraved into the box lid.
- Laser engraving/marking of wood, acrylic, coated metals, plastics, leather, rubber, and semiconductors. Etched Images can engrave text, serial and part numbers, company logos, bar codes, or 2D codes, whether they are flat sheets, curved surfaces, or cylinders.
- Refrigerated (55ºF) wine storage.
- Etched Images is a bonded warehouse (BW 5999 CA).

For more information, contact:

Etched Images
Kathy Jennings
1758 Industrial Way, Ste. 101
Napa, CA 94558
e-mail: kathy@etchedimages.com
website: www.etchedimages.com

Encore!

ENCORE! has been supplying and serving wineries since 1975 and has grown to fulfill the glass and packaging needs of over 400 wineries in the western United States. ENCORE! has attained this growth by giving each customer the individual attention they deserve.

ENCORE! distributes more than 55 wine bottles in nine different colors with various finishes that range in sizes from 187ml to five liter. ENCORE! also carries a wide selection of European styles for special products and does label removal, bottle washing, sterilization, decanting, and repacking.

With over 28 years of experience, ENCORE! is a leading innovator in wine packaging to suit all needs whether they be bottles, ceramic decorating, litho cartons, specialty bottles, or just regular bottling needs. ENCORE! is very interested in what you want!

ENCORE! supplies molded wine shippers in two- and three-pack formats with matching cartons that meet Wine Institute/CAWG purchasing guidelines for sustainable packaging. The two-pack trays are available in two-, four-, six-, and twelve-pack shippers; the three-pack trays in three-, six, and twelve-pack shippers.

For more information, contact:

ENCORE!
860 S. 19th St., Richmond, CA 94804
tel: 510/234-5670; fax: 510/234-0433

PLEASE SEE THE ENCORE! AD, PAGE 24.

Cork Supply USA, Inc.

Cork Supply USA (CSU), a leading supplier of premium wine cork, is ISO 9002-certified as is its laboratory in Portugal, Global Quality Assurance, and one of its manufacturing facilities, Cork Supply Portugal.

CSU's Equipar is a partnership with cork growers owning 12% of the Portuguese cork forest enabling the control of cork quality from "forest to bottle."

CSU products include: Alpha corks (hydrogen peroxide wash), Natura corks (potassium metabisulfite wash), 1+1 corks, colmated corks, sparkling wine corks, and large diameter corks for oversize bottles. Designs may be printed or firebranded (including cork ends).

NOMACORC synthetic corc is proving to be a superb alternative closure. Manufactured of co-extruded polyolefins, NOMACORC inserts consistently, seals effectively, is sensorily neutral, and is easily removed from the wine bottle.

SolidPhaseMicroExraction (SPME) has been implemented by CSU to detect TCA in cork lots. The Portuguese Quality Assurance lab has a GC/MS to scientifically qualify cork lots before CSU purchases them. Equipar and Cork Supply Portugal run SPME on raw material and on finished corks. As a Cork Quality Council member, CSU does additional SPME testing at an enological laboratory to assure customers the cleanest cork lots.

Corks are coated in its Precision Plus Coating System, enabling fine-tuning of coatings for optimum performance. The expanded Triple Quality Assurance Program, a modern, highly technical production system, and responsive customer service insures consistent, superior cork quality and on-time deliveries to customers.

For more information, contact:

Cork Supply USA, Inc.
537-F Stone Rd., Benicia, CA 94510
tel: 707/746-0353; fax: 707/746-7471
e-mail: sales@corksupplyusa.com
website: www.corksupplyusa.com

PLEASE SEE THE CORK SUPPLY AD, PAGE 2.

Jeffrey Caldewey Design

Jeffrey Caldewey specializes in brand identity, package design, image development, and market support. "In a world of luxury consumption, wine has become a primary cultural icon," states Caldewey. "It reflects a nobler era venerating the virtues of an artisan-made product, produced from hand-tilled soil, in rhythm with the seasons."

The idea of personality is at the core of Caldewey's designs as they translate the personal vision of a client into a highly desirable, world-class brand. "All aspects of brand development stem from the label," explains Caldewey. "It is part symbol, part memory, and part storytelling. Not only does the package personify the personality of the product; it has the power to transform our own sense of identity."

Jeffrey Caldewey has recently joined forces with noted designer, Chuck House to form the design collaboration, ICON Design Group, an event commemorated by the publication of their book, "ICON: Art of the Wine Label," in June 2003.

For more information, contact:
Jeffrey Caldewey Design
5301 Redwood Rd., Napa, CA 94558
tel: 707/252-6666; fax: 707/252-6742
www.caldewey.com

Great Engineering

Great Engineering is a world leader in the manufacturing of bench-top labeling machinery. The company's success is built around the principles of simplicity, value for money, and its patented technology for the application of pressure-sensitive labels. In the last decade, 23% of Australian wineries adopted Great Engineering labelers and the labeling machines have been exported to 21 other countries, including the United States.

Great Engineering offers a hand-operated labeler, the Benchmate, and two motorized, semi-automatics — the Benchmark for bottles up to 750ml, and the Benchmax for bottles up to 3 liters (with added orientation, press-button and foot control, plus higher output).

The machines, which are easy to operate, can apply a single label or front and back labels (in one pass), are extremely reliable under the rigorous demands of wine production. All commercially available pressure-sensitive label substrates can be applied to a wide variety of bottle sizes.

Whether the customer needs primary labeling, re-labeling in register, special feature or award labeling, over-labeling, or when integrated with a printer, print and apply, Great Engineering's machines can do it all.

Visit **www.greatengineering.com** for more information.

For more information, contact:
BritMek, Inc.
Ian Westbury
801 17th St., Ste. B, Modesto, CA 95354
tel: 209/523-8610; fax: 209/523-8611
e-mail: info@britmek.com

Ramondin USA, Inc.

Ramondin has been making capsules for the wine industry since 1890. Ramondin was the first tin capsule manufacturer to receive the ISO 9001 certification, complying with strict standards of quality, safety, and service, and the ISO 14000 certificate, which has special emphasis on protecting the environment.

A new factory was designed and built to manufacture quality tin capsules. With recent innovations in decorating machines, Ramondin can create intricate designs for a lower cost. From traditional to cutting-edge design, the tin capsule identifies and protects your product.

Tin is an excellent replacement for environmentally-undesirable metals and plastics. Ramondin buys the purest tin and processes the silvery metal into a perfect closure. Ramondin's continued commitment to protecting the environment has led to development of water-based paints — no more solvents.

Recyclability is one of tin's great merits. Ramondin's recycling program encourages wineries to save plastic trays for reuse in new tin capsule orders. This is a huge project, but one that Ramondin feels is the right thing to do to reduce packaging waste and out of our landfills.

"Think green. Think Ramondin — capsules and only capsules — for over 100 years."

For more information, contact:
Ramondin USA, Inc.
2557 Napa Valley Corporate Dr., Ste G
Napa, CA 94558
tel: 707/944-2277; fax: 707/257-1408
e-mail: ramondin@ramondinusa.com

PLEASE SEE THE RAMONDIN AD, PAGE 3.

SAVERGLASS, INC.

Due to customer demand, Saverglass, Inc. has released the Paradis, a new high-end design in the company's Bordeaux line of wine bottles.

The Paradis' new shape complements the popular Hermes bottle in the same ultra-premium Saverglass Bordeaux line. The Paradis retains the larger neck, seductive body, and elegant shoulders of the other ultra-premium Bordeaux bottles, but with a very deep punt. It will fit well with its Burgundy companion, the Divine.

Saverglass bottles can be customized with embossing, bas-relief, and the company's unique ring-finish engraving. Other techniques, such as silk-screening, tampographic printing, sand blasting, and a proprietary color coating system, can be applied to any bottle in the company's line of still and sparkling wine bottles.

Saverglass, Inc. was opened in 1995 as the exclusive U.S. importer of wine bottles produced by French manufacturer Saverglass. Over 200 new shapes are created annually in order to offer a full breadth of designs.

With state-of-the-art factories in Feuquières and Le Havre, France, Saverglass employs over 1,400 workers and operates four furnaces and 20 production lines, yielding an annual production capacity of 220,000 tons, strategically split between two plants for maximum reliability.

For more information, contact:
Saverglass, Inc., Erica Harrop
860 Napa Valley Corporate Way, Ste. S
Napa, CA 94558
tel: 707/259-2930; fax: 707/259-2933
e-mail: elh@saverglass.com website:
www.saverglass.com

PLEASE SEE THE SAVERGLASS AD, PAGE 21.

tech(œ)nology

Quality winemaking combines art and science. This is also true of quality wine closures. Sabaté utilizes state-of-the-art technology and over 60 years experience to produce natural corks and cork-based closures designed to preserve the inherent quality of your wines. By listening carefully to our clients'needs and employing aggressive research and development efforts, we are uncovering innovative ways to make our closures even better.

We are committed to technical innovation and to true collaboration.

The fusion of art and science. Good for v Good for you.

SABATÉ
USA

902 Enterprise Way, Ste M - Napa, CA 94558 - Ph : (707) 256 2830 - Fax : (707) 256 2831 - www.sabate.com

PackagingARTS

PackagingARTS offers vibrant graphics for club store multi-pack applications and provides an economical alternative to traditional structures with high-end graphics that shrink two or more items for value-pack promotions.

PackagingARTS collaborates with clients and industry resources, sharing the staff's knowledge and experience in all phases of the assignment — from design to fulfillment.

Founded in 1995, the Mare Island, CA-based firm offers graphic design and production art services for package and promotional printing. Depending on your needs, the PackagingARTS team can provide a spectrum of products including point-of-sale, displays, cartons, bags, labels, and bottle decorating.

For more information, contact:
PackagingARTS
California:
700 Walnut Ave., Mare Island, CA 94592
tel: 707/562-2787; fax: 707/562-2797
e-mail: dave@packagingarts.com
website: www.packagingarts.com
Colorado:
32052 Horseshoe Dr., Evergreen, CO 80439
tel: 303/674-2553; fax: 303/647-2574
e-mail: rhswain@packaginarts.com
website: www.packagingarts.com

Pickering Winery Supply

Pickering Winery Supply distributes natural and synthetic corks from Heinrich Gültig, and tin and polylam capsules from VKN-Nachenheim, both in Germany.

Gültig has tested every bale from every lot of natural corks for TCA contamination since December 2001 using rigorous QA methodology. Using the SPME method and its in-house GC/MS, suspect lots are returned to Portugal. Because of their proprietary peroxide wash and unique resin coating, Gültig corks are among the most neutral available.

Gültig's synthetic stopper, VISION, is made by an extrusion process that guarantees uniformity, low SO_2 loss, and excellent shelf life. VISION also prints perfectly and performs during insertion and extraction just like a natural cork.

Gültig's Vision

Gültig delivers corks by air weekly arriving at the customer's door within days of passing outgoing QA. Samples from individual lots and their GC/MS scores are handled expeditiously.

VKN offers tin capsules from 95 microns and up. Four-color side printing, side embossing, and clear-top embossing offer virtually limitless design possibilities. VKN's abrasion-resistant coating protects your logo from scuffing when bottles are shipped neck down. In addition to regular polylams, VKN offers individually decorated polylaminated capsules called Polux that are indistinguishable from tin except for the pleat.

For more information, contact:
Pickering Winery Supply
888 Post St., San Francisco, CA 94109
tel: 415/474-1588; fax: 415/474-1617

PLEASE SEE THE PICKERING WINERY SUPPLY AD, PAGE 48.

Saint-Gobain Containers

As a leading glass supplier to American wineries, Saint-Gobain has a legacy of product innovation, craftsmanship, and customer attention that spans two continents and three centuries.

SAINT-GOBAIN CONTAINERS

After more than 300 years as one of Europe's premier bottle makers, Saint-Gobain started in America in 1995 as Ball-Foster Glass, an entity formed from the union of two U.S. companies, each with more than 100 years of distinguished glassmaking experience. Today, Saint-Gobain Containers continues to uphold that tradition of excellence, having been awarded more than 30 Clear Choice Awards from the Glass Packaging Institute.

Saint-Gobain Containers is proud of its partnerships with many of America's most accomplished vintners and of the part its products have played in the growing worldwide recognition of American wines.

For more information, contact:
Saint-Gobain Containers
Marilyn La Grange
1509 S. Macedonia Ave., Muncie, IN 47303
tel: 765/741-7622
website: www.sgcontainers.com

PLEASE SEE THE SAINT-GOBAIN AD, PAGE 17.

Jonergin Pacific

Jonergin Pacific offers exceptional, consistent quality and on-time delivery at a competitive price.

Specializing in providing superior quality printing of pressure-sensitive wine labels, Jonergin Pacific uses eight-color waterless offset technology with inline multiple hot foil stamping, multiple embossing, multiple rotary screen, multiple coating, and rotary or flat die-cutting.

JONERGIN
PACIFIC

The Jonergin sister division to Jonergin Pacific, specializes in sheet-fed litho, flexo, and letterpress technologies to provide very competitive glue-applied and pressure-sensitive label solutions to the wine industry, and offers special expertise in metalized papers.

With a highly focused and experienced staff in all aspects of wine label printing, substrates, adhesives, and the label application process, Jonergin Pacific is dedicated to providing craftsmanship, innovation, quality, and service.

Call Jonergin Pacific to arrange a facility tour and capability presentation in Napa. Visit the climate-controlled, environment-friendly press-room and well-equipped pre-press department. Meet the company's team of wine label experts to discuss Jonergin Pacific's capabilities in label application and your labeling specifications.

For more information, contact:
Jonergin Pacific
1901 N Kelly Rd., Napa, CA 94558
tel: 707/226-2806; fax: 707/226-2894
e-mail: labels@jonerginpacific.com

Rivercap USA

Rivercap, a family-owned company based in Spain, specializes in production of premium-quality tin capsules for the wine industry. The company was founded in 1990 by Enrique Echepare, a trained mechanical engineer with 20 years experience in production of one-piece punched capsules, originally tin-lead and subsequently pure tin.

Rivercap was the first capsule manufacturer to produce tin from the outset. All punching, painting, and decorating machines are designed and built in-house. Each machine incorporates innovative improvements to improve decorating capabilities and meet the increasing demands of marketing and design departments.

Registered silk-screen colors on the side and either embossed or silk-screened top decorations are all standard features. Rivercap can work with material thickness ranging from 80-micron tin for the standard bottleneck finish, to 140-microns for new fat-neck bottles.

Capsule sizes range from 27.00-mm diameter to 33.25-mm for standard 750-ml bottles. Larger sizes are available for three-, five-, and six-liter bottles.

Rivercap's in-house design department can design and develop decorations to match labels, and colors are blended to match either Pantone references or a customer's particular color swatch. All paints provide superior resistance to scuffing.

"Let Rivercap put the finishing touch to your premium bottle of wine."

For more information, contact:
Rivercap USA
537 F-Stone Rd., Benicia, CA 94510
tel: 707/747-3630; fax: 707/746-7471
e-mail: sales@rivercapusa.com

PLEASE SEE THE RIVERCAP AD, PAGE 56.

Sabaté USA, Inc.

Sabaté USA offers a diverse portfolio of innovative, top-quality cork and cork-based closure solutions to winemakers, including natural cork now finished in a new state-of-the-art facility in Napa, CA. In addition to Sibel sparkling wine closures, Sabaté offers a line of cork-composite closures: Altec®, Evolution®, Reference®, one-plus-ones, and Altop® bartops.

SABATÉ

Based in the south of France, Sabaté SAS controls production from the forest to the bottle ensuring quality control that meets the high standards of ISO 9002 certification. The company employs advanced Solid Phase Micro Extraction/Gas Chromatography/Mass Spectrometry testing as part of its quality assurance program.

Sabaté USA is a division of Sabaté-Diosos Group, a world leader in oak barrel making for fine wine, and the wine closure sector.

For more information, contact:
Sabaté USA
902 Enterprise Way, Ste. M, Napa, CA 94558
tel: 707/256-2830; fax: 707/256-2831
e-mail: sabateusa@sabate.com
website: www.sabate.com

PLEASE SEE THE SABATÉ USA AD, PAGE 69.

Upcoming Showcases:

Vineyard Supplies & Services
September/October 2003

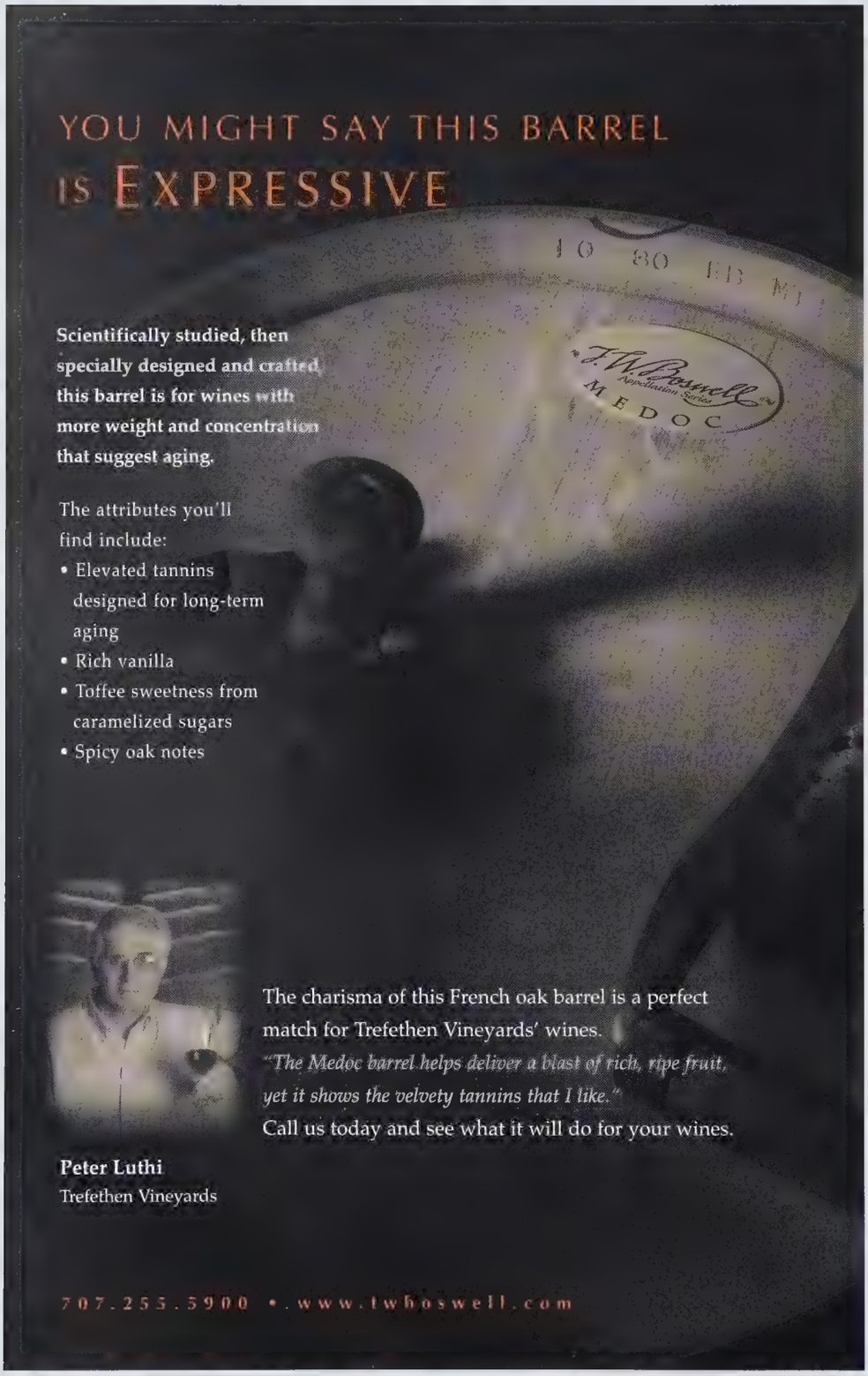
Professional Services
November/December 2003

Winery Equipment & Cooperage
January/February 2004

Call *PWV* to book a Showcase:
415/479-5819

Pacific Southwest Container

Founded in Modesto, CA, in 1973, Pacific Southwest Container (PSC) has grown from a small, family-owned business to a 500,000-square-foot powerhouse. PSC designs and produces custom product packaging solutions, including corrugated, single-face lamination, protective packaging, and folding cartons, for a variety of clients.


YOU MIGHT SAY THIS BARREL
IS EXPRESSIVE
Scientifically studied, then specially designed and crafted this barrel is for wines with more weight and concentration that suggest aging.
The attributes you'll find include:
• Elevated tannins designed for long-term aging
• Rich vanilla
• Toffee sweetness from caramelized sugars
• Spicy oak notes
J.W. Boswell
MEDOC
The charisma of this French oak barrel is a perfect match for Trefethen Vineyards' wines.
"The Medoc barrel helps deliver a blast of rich, ripe fruit, yet it shows the velvety tannins that I like."
Call us today and see what it will do for your wines.
Peter Luthi
Trefethen Vineyards
707.255.5900 • www.twboswell.com

As one of the west coast's largest independent paperboard converters and foam fabricators, PSC purchases raw materials and supplies on the lowest cost basis. PSC manufactures and warehouses its customers' packaging to provide delivery on a 24-hour schedule.

PSC produces nearly 1,000 jobs per month, including 100 to 200 brand new designs.

This aggressive production capacity requires a teamwork approach to understanding and meeting customers' needs. PSC's sales and customer service representatives work closely with clients and interface directly with in-house design and manufacturing departments to ensure projects are completed to specification and budget.

PSC has received the ISO 9001 certification for its commitment to quality — every stage of its quality system has been thoroughly examined against the most exacting set of internationally recognized standards.

Because PSC is continually focused on improving production quality, speed, and dependability, staff members strive to meet an even higher standard than ISO 9001 … customer satisfaction.

For more information, contact:
Pacific Southwest Container
Bryan Smith
4530 Leckron Rd., Modesto, CA 95357
tel: 800/772-0444; fax: 209/522-8746
e-mail: bsmith@teampsc.com
website: www.teampsc.com

PLEASE SEE THE PACIFIC SOUTHWEST CONTAINER AD, PAGE 57.

G-3 Enterprises

In January 2003, four companies that have served the wine industry for decades combined efforts to become a new, single-solution provider of a variety of products and services. The newly-formed G-3 Enterprises consists of five operating divisions:

- **Closure Division** (formerly Midcal Packaging Technologies) is a manufacturer of roll-on pilfer-evident aluminum caps, corks, capsules, injection-molded products, and other closure materials.
- **Label Division** (formerly Grand Street Printing Technologies) is a manufacturer of sheet-fed, glue-applied labels, and color separations.
- **Logistics Division** (formerly United States Intermodal Services [USIS] and San Joaquin Valley Express [SJVE]) provides freight, warehousing, and other logistical support for cased goods, bulk materials, bulk liquid transport, and grape hauling.
- **Bottle Decorating Division** (formerly SJVE) offers two distinct bottle decorating technologies, heat transfer labeling for permanently affixed labels, and pressure-sensitive labeling applications.
- **Real Estate Division** (newly formed) manages a moderate real estate portfolio and has mineral-rich water available.

Each division will continue to focus on its area of manufacturing and service expertise, while marketing efforts will be unified to provide a comprehensive package of products and services. This will allow the wine industry to benefit from a single solution supplier.

For more information, contact:
G-3 Enterprises
Kyle Rossler, VP Sales & Marketing
502 E. Whitmore Ave., Modesto, CA 95358
tel: 209/341-7770; cell: 209/968-1936
fax: 209/341-1929
e-mail: kyle.rossler@g-3enterprises.com

PLEASE SEE THE G-3 ENTERPRISES AD, PAGE 44.

Lafitte Cork & Capsule, Inc.

Lafitte Cork & Capsule, Inc., is one of the leading companies in California supplying natural corks and quality capsules.

Lafitte Cork & Capsule is a subsidiary of Lafitte Industries along with Lafitte Cork Portugal, an ISO 9002-certified cork manufacturer producing and distributing more than 400 million corks annually around the world.

Extensive quality control procedures and an on-site $4 million inventory make Lafitte one of the most reliable and competitive cork suppliers in the industry.

Lafitte capsules are produced in France by C.M.E. (Coliege Metalco Emballage). These are high quality PVC, tin, or polylam capsules, which offer unique printing reproduction, such as nine-color decorated PVC capsules.

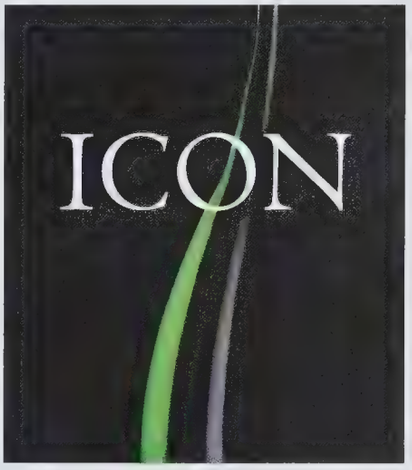
In addition, an all-metal ECOCAP capsule provides the performance of tin capsules with 20% cost savings.

For more information, contact:
Lafitte Cork & Capsule
45 Executive Court, Napa, CA 94558
tel: 707/258-2675; fax: 707/258-0558
e-mail: brucker@lafitte-usa.com
website: www.lafitte-usa.com

PLEASE SEE THE LAFITTE CORK & CAPSULE AD, PAGE 30.

ICON Design Group

With the creation of ICON Design Group, Jeffrey Caldewey and Chuck House bring together their unique philosophies and talents in a business collaboration that represents the depth of their individual careers and a vision for the future of wine-package design and marketing.



In the words of Robert Mondavi, "With careers that parallel the rise of the California wine industry, Caldewey and House have shaped and influenced the evolution of the international wine label and developed the concept of the wine package as both art and commercial enterprise."

Caldewey's office is located in Napa, CA — House's in Santa Rosa, CA.

For more information, contact:
ICON Design Group
Jeffrey Caldewey and **Chuck House**
website: www.icondesigngroup.net

California Glass Company

California Glass Company and its affiliates offer a comprehensive range of packaging goods and services to the wine industry, both nationally and internationally. The Cal Glass/Pacific Coast Container family represents Owens-Illinois, Inc. and St. Gobain USA, the largest North American manufacturers of wine bottles, and offers private and stock molds from numerous European and domestic manufacturers.

The combined companies maintain one of the largest sales and support staffs in the U.S. to address wine industry needs. Technical service representatives are available to troubleshoot line problems and an in-house graphics department can, in conjunction with your graphic design firm, turn artwork into a printed carton with minimum lead-time.

The array of products include: bottles; wine glasses; label and case-seal adhesives; tin, polylaminate, and PVC capsules; plain and branded corks, including Duo Disc® technical corks, all from Cal Cork™; Ship & Store® wine packs, specialty corrugated cartons, and basket carriers.

Services include ACL decorating of glassware and bottles, up to three colors on both sides. Any PMS color including bright metallics can be matched.

For more information, contact:
California Glass Company
tel: 510/635-7700; fax: 510/638-7624
website: www.calglass-pcc.com
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PLEASE SEE THE CALIFORNIA GLASS COMPANY ADS, PAGES 36, 61.

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PLEASE SEE THE MARINER PRINTING AD, PAGE 49.

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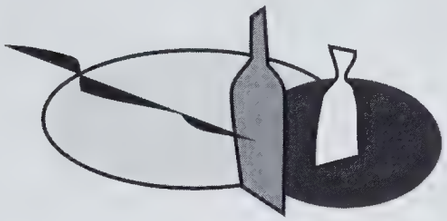
Bergin Glass Impressions



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PLEASE SEE THE PYRAMID LABEL AD, PAGE 43.

Draconic inspiration wraps Greenwood Ridge bottles

BY Tina Vierra

Greenwood Ridge Vineyard's new signature look has a unique wraparound fire-breathing dragon applied by silkscreening. Allan Green, owner (Mendocino County, CA), was a graphic artist before he started making wine in the 1980s. For his wine packaging in 2003, he combined his graphic design skills with his winemaking needs, and added a whimsical bow to his past.

Green actually developed the dragon design about two years ago for a winery-sponsored baseball team, the Greenwood Ridge Dragons. His inspiration was a bronze dragon sculpture his father, Aaron G. Green, donated in 1959 to the Frank Lloyd Wright Foundation. The Foundation installed the dragon at Taliesin West, a Wright-designed complex in Scottsdale, AZ, and rigged it to literally breathe flames.

Illustrator David Danz developed a metallic-bronze dragon for the team shirts, and Green also used it on chocolate bars sold in his tasting room. Printed by McCoy Packaging in Petaluma (now owned by Paragon Label), the chocolate bar labels earned a 2002 design award from *Print* magazine.

Bergin Glass Impressions (Napa, CA) first brought the design to life on the Greenwood Ridge olive oil (a special blend for sale in the tasting room), and now wine bottles. They worked up a clear, wraparound label which could be silkscreened onto the bottles, a process made more expensive by the actual metals used to achieve the bronzed dragon — copper on white wine bottles, gold leaf on reds.

Michael Bergin explains the process: "ACL (applied color labeling, also known as silkscreening) is a decorating process whereby ink colors are applied directly onto the glass surface. We use thermal plastic inks that have glass frit (minute bits of ground glass) in their mixture, so that when bottles are being fired through our furnace at 1200°F, the colors literally fuse into the glass surface, thereby permanently bonding the images into the glass."

The ACL process is a useful alternative for wineries with designs like the dragon, which are difficult to replicate with glue or pressure-sensitive labeling. ACL designs can be printed 360 degrees around the bottle, at odd angles or with "floating" or split effects.

A wraparound dragon now appears on all Greenwood Ridge bottles

"We use a mobile bottler, and it's very nice on bottling day, not to have to deal with labels," Green says. In his experience, labeling can be the most troublesome part of the bottling process. The bottles went from the bottle supplier (Caliber Company, Benicia, CA) to Bergin Glass Impressions. Clear bottles for Pinot Grigio and Sauvignon Blanc are frosted prior to ACL decoration. The bottles are vintage-dated.

"It's worth the expense," Green declares. "We got such beautiful, clean results from silkscreening. We won't have any scuffed labels, no crooked or torn labels, no edge wear, no problem with wines in ice buckets; if one bottle in a case breaks in shipping, the others aren't damaged by leakage."

Green cautions that a winery must be careful to order the exact quantity, or it will wind up short for its bottling run, or have excess to recycle. Other disadvantages: no copies of their labels available for use or publication. Wineries also need to be careful of the lead time needed for ACL processing of bottles. Greenwood Ridge has to make decisions about timing and quantity before final filtration, so it has to estimate the final volume of wine to bottle.

Greenwood Ridge has now released a 2002 Sauvignon Blanc, 2002 Pinot Grigio, and 2002 late harvest White Riesling in the dragon package. A full line of shirts and caps has been printed for tasting room and website sales. By the end of summer 2003, all Greenwood Ridge wines (7,000 cases), tasting room items, and baseball players will be wearing the dragon. ■

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Wine Quality

Continued from page 24

This focus on irrigation management doesn't mean Hess is ignoring other factors, emphasizes Camera. "This kind of management assumes that you have fine-tuned everything else — vine spacing, rootstock selection, nutrient balance, timely trimming, and suckering. Irrigation goes hand in hand with all the other fine-tuning we do, it's not independent."

With deficit irrigation, it's as vital to know when not to water as it is to know when irrigation is a must. Camera recalls, "On Mt. Veeder, we gather rainwater for irrigation. In 2001, if I had watered according to the old method, we could have run out of water and had a disaster. Being able to conserve water early in the season [because he knew the vines didn't need it], meant I had water when I needed it later in the season."

Camera also points out the value of irrigating only when you know the vines need it for the sake of conserving a vital resource. "If you can conserve 20% of the water you would have used, then you've saved a lot. From a conservation point, I think that, in the next 10 years, California growers will be required to use these methods before they water."

How much water does Hess use? "We're still fine-tuning," replys Camera, "but four to six gallons per week per vine, once we start irrigating. We like to have moisture in the soil, because then, when heat events happen, we think the vines will do better. We start watering as soon as we see the stress level where we want it to be, though it depends somewhat on the varietal, vine spacing, soil depth, water holding capacity of soil, and rootstock (some gather water more quickly than others)."

Deficit irrigation to manage quality

There's not much argument that deficit irrigation can increase red wine quality. "It's the kiss of death to overwater red wine grapes," says Camera. But how much water is enough? How much stress is too much?

That appears to depend on the grape variety. The stress index works the same way from variety to variety, says Rahn, the stress indicators are the same. "But the level of stress you allow in each variety is different." This is the heart of the matter, as far as he is concerned. "The onset of stress and how high the stress level is allowed to go impacts fruit quality."

With 15 to 18 years of stress index assessment behind him, Rahn maps stress index patterns for every vineyard he works with. "The patterns tell you what happened, and those patterns can be associated with wine quality. They tell you how long the grapes were stressed and how stressed they were." Even better, Rahn finds that by adjusting the stress, a grower can impact wine quality and style.

"We study the vineyard's stress index patterns and then go to the winery and ask 'How did we do?' The winery tells us what they think of the wine quality, and that gives us insight on how to adjust our water management strategy for the wine quality and style the winery wants.

"We have identified some strong correlations between stress index patterns and wine quality for some varieties [and clones], and we are working on others," says Rahn, adding, "There are general red grape patterns and white grape patterns, but there are some exceptions as well.

"Ultimately, the wineries will provide more guidance, telling us what they like and don't like, and then we can look to see if water management was an issue."

Creating a digital inheritance

At Hess, Camera says, "We have a very accurate graphic composition of the data, and we can compare year to year and produce a history." He and his colleagues compare a year's data (including Rahn's stress index patterns) with the vintage quality and determine what worked. "History and charts from earlier years can show us at what point to water and help us fine-tune the information for the next year."

Camera and his colleagues also share what they learn with Hess contract growers and vineyard management companies. "We like to proselytize our growing methods. Many wineries don't farm on any scale and can't pass on information to growers, but anything we learn that has application for us or our growers, we pass on to them."

The growing library of information about the Hess vineyards is like the family knowledge passed down from one generation to the next in vineyards in France, suggests Camera. "It's like our digital inheritance, our digital heritage. The guy who comes after me will be able to know what I did. Management change won't have to change the product. We want that consistency in our wine." ■

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Screwcaps

Continued from page 64

(a separate marketing company known as Winery Associates, headed by Dave Ready Sr.) was able to pre-sell the brand.

They went out to distributors and retailers and every outlet in their supply chain to talk it up. The package came together easily with a metallic tin look, pen and ink drawings of the salesman's tin roof. The back label contains tongue-in-cheek instructions on how to open the wine. There is a no-corkscrew icon on the top label. From the wine itself to the packaging and market placement, they aimed for light, bright, and fun. Suggested retail is $9.

"We don't want consumers thinking of Tin Roof with a 'second label stigma,' that it won't be as good as what we put under the Murphy-Goode label with a cork," says Ready Sr. "It's a very well-made wine in a different style. The wine is serious, first-class. But we're going to have some fun with it." They've targeted in-store sales at chains, giving mini-seminars in wine shops, and hand-selling to many distributors.

Pre-orders are strong in casual restaurants, though "white-tablecloth" restaurants are leery. Bartenders love it for by-the-glass sales. The catering director at the Phoenix Biltmore hotel is a big fan, claiming that Sauvignon Blanc is very popular for large crowd events and that with screwcaps, they won't have to pour out the many opened bottles at the end of an event. Ready Sr. hopes to do more seminars and tastings. The goal is sell-through of the brand by the end of summer.

Stuart Winkelman at Downing Family Vineyards sells his small production of screwcap Zinfandel side by side with the same cork-sealed wine, at the same price of $30. By using a website and mailing list to educate his core audience, he's raised sales of the screwcap wine to equal sales of the wine with corks.

"We had to teach them it's not a gimmick or a gadget," Winkelman explains the spadework. "In the beginning, with distributors and retailers, it was 'not in my state, not in my store.' But in our second vintage, they were coming back for it. Restaurants are the best — great customers. And wine tasting bars, bars who sell by the glass."

Another surprising success for Downing came with sommeliers on a recent trip to New York. "They're thrilled, because they're the ones getting corked wines sent back and having their reputations hurt by it," Winkelman reports. "They often open and decant the best ones away from the table anyway, so the appearance of the closure isn't even an issue in those cases."

In his travels to tastings like ZAP and the recent New York selling trip, Winkelman sees an age difference in customer acceptance of screwcaps. Consumers age 45 and older hold a preference for cork. But most consumers younger than 40 are interested or downright embracing the screwcap idea.

Winkelman reports the #1 consumer question is, 'What about the romance of the cork?' "I tell them there's nothing romantic about a tainted bottle. Tradition gives way to a better way to do something."

WillaKenzie Estate sells several screwcap wines at prices ranging from $18 to $36. While super-premium wines in screwcap are still rare in the marketplace, Osborn is confident they can sell out.

"We have already sold out our entire production of 2001 Pinot Gris with screwcaps and corks and have nearly done the same with the 2001 Pinot Blanc, which was released almost six months later than the Pinot Gris," reports Osborn. "The response for these two wines has been extremely positive. We have just released our first Pinot Noir with screwcaps, and the initial response to our first screwcap red is equally as strong."

WillaKenzie's biggest market is its own backyard, the Pacific Northwest, but it has national distribution at a mixture of 70% on-premise and 30% off-premise sales, plus a wine club and tasting room where customers are educated and can taste the wines. The screwcap-packaged wines are sold via all the same channels as the cork-packaged wines.

Bonny Doon has gone with a full frontal assault on all marketplaces and media outlets it can reach. Packaging is designed individually for the myriad of wines Bonny Doon produces, each with its own "personality." Bottle shape, labeling, and even screwcap imprinting are all integrated to create each wine's look and feel. Neck hangers have been added to educate consumers on the benefits of screwcaps, titled with the eye-catching phrase, "Are you getting screwed?"

Nicolas Tucker, Bonny Doon marketing director, says the winery is playing with more and more packaging options, exploring a wider array of bottle molds from existing sources and developing new molds for its wide variety of products. Seven Bonny Doon wines will be bottled in screwcaps in 2003 (totaling more than 200,000 cases). The winery's goal is to have all Bonny Doon still wines in screwcaps in 2004.

"We believe that it is precisely the right time to introduce screwcaps into North America," says Tucker. "There is still a great deal of education required to bring around 'Joe Six Cork,' but based on the response of our customers, the most progressive and knowledgeable wine drinkers are quite open-minded and accepting of screwcaps." ■

Resources: ***PWV*** *thanks all participating wineries for their generous help with this report, and the following industry resources:*

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Peter Godden, The Australian Wine Research Institute, PO Box 197, Glen Osmond, SA 5064. Email: peter.godden@awri.com.au.

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David Schwandt, Demptos Glass Co., 2300 Cordelia Rd., Fairfield, CA, 94585; Tel: 707/422-9999; Fax: 707/422-1242; www.demptos.com.

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Mike Aplin, M&D Specialties, 17301 NW Oak Ridge Rd., Yamhill, OR, 97148; Tel: 503/662-4516.

Etienne Moly, Pechiney Cork & Seal, 5425 Broadway, American Canyon, CA, 94503; Tel: 707/257-6481; Fax: 707/257-8028; www.pechiney.com.

Erica Harrop, SaverGlass, 860-S Napa Valley Corporate Way, Napa, CA, 94558; Tel: 707/259-2930; Fax: 707/259-2933; www.saverglass.com.

2003/2004 FUNDING YEAR

AVF surpasses $15 million in research grants

With the recent granting of $1,001,000 for 2003–2004, the American Vineyard Foundation (AVF) surpassed the $15 million mark in research grants since 1987, according to Patrick Gleeson, AVF executive director. The organization is funding 29 projects directly this fiscal year, and by working with other commodity groups and state and federal agencies, it is leveraging a total of $2.9 million to fund other research projects.

"Reaching a milestone like $15 million shows the importance that our wine industry places on research," notes Gleeson. "Thanks to our partnerships and cooperative funding efforts, we have been able to maximize our research investment. For every dollar that AVF puts towards research, we are able to attract three to four additional dollars."

"The methodology of deciding where the grant money can best be invested is a very dynamic process," says Gleeson. "For instance, by working cooperatively with the California Competitive Grant Program for Viticulture and Enology Research (CCGPRVE), the Viticulture Consortium (VC) Program, the California Rootstock Improvement Commission (CRIC), the California Table Grape Commission (CTGC), Raisin Advisory Board (RAB), and other organizations, we reviewed 113 proposed projects and funded 60. By working together we are able to ensure important projects are not missed or that research is not duplicated."

Gleeson notes that working together has also enabled the groups to react quickly to industry needs. "This year we cooperatively awarded just over $290,000 for research to battle a growing threat, the vine and grape mealy bugs. A few years ago these pests were rated as medium to low priorities, but recently there have been a few outbreaks in California. So this year we were able to act proactively and devote over a quarter million dollars in research funds to fight it."

The five grants for vine and grape mealy bug research include:

$85,846: Population dynamics of the vine mealybug and its natural enemies in Coachella and San Joaquin Valley grape growing regions. Researcher: Kent Daane. Funding: CCGPRVE, CTGC, and RAB.

$82,000: Grape mealybug complex and its natural enemies to improve biological control. Researcher: Ken Daane. Funding: AVF, VC, and CTGC.

$58,720: Vine mealybug mating disruption with synthetic sex pheromones. Researcher: Ken Daane, Walt Bentley. Funding: CTGC.

$39,721: Pheromones for sampling major mealybug pests in California vineyards. Research: Jocelyn Millar. Funding: VC and CTGC.

$25,000: Management of vine mealybug, Planococcus ficus, in grape nurseries with insecticides and a hot water treatment program for dormant propagation materials. Researchers: David Haviland, Walt Bentley, Funding: other groups.

The next 25 largest grants are:

$287,575: Development and implementation of control methods for Eutypa Dieback disease. Researchers: David Block, Lynn Epstein, San Liang Gu, Doug Gubler, Jean Vandergheynst, Russell Molyneux. Funding: AVF, CCGPRVE.

$250,000: Prediction, analysis, prevention, and treatment of slow and incomplete fermentations. Researchers: Linda Bisson, David Block, Charles Edwards, Dave Mills. Funding: AVF, CCGPRVE.

$80,240: Temporal and spatial patterns of water and nutrient availability and the physiological capacity of root nutrient acquisition in dry soils under deficit irrigation. Researcher: Dave Smart. Funding: VC.

$80,219: Growth and sugar transport in grape early events in ripening. Researchers: Mark Matthews, Ken Shackel. Funding: VC.

$70,000: Expression of anti-microbial genes in transgenic grapevines for enhanced disease resistance. Researchers: Bruce Reisch, Julie Kikkert. Funding: AVF and other groups.

$55,658: Identification of factors that influence the level of polymeric pigments and tannins in grapes and wines. Researcher: Doug Adams. Funding: AVF, CCGPRVE.

$51,875: Grapevine leafroll associated Virus-9 (GLRaV-9), molecular characterization and development of PCR methodologies for its detection. Researcher: Adib Rowhani, Funding: VC.

$50,362: Seasonal patterns of root physiology and dynamics of *vitis vinifera* cv Merlot on two rootstocks under different levels of irrigation Researcher: David Eissenstat, Dave Smart. Funding: VC.

$50,000: Breeding rootstocks resistant to aggressive root-knot nematodes. Researcher: Peter Cousins. Funding: AVF, CTGC, and other groups.

$47,000: Development of grape rootstocks with broad and durable nematode resistance. Researchers: Howard Ferris and Andy Walker. Funding: AVF, CCGPRVE, CTGC, CRIC.

$46,928: Methods to predict phenolic extraction from berries during winemaking and chemical changes in phenolic composition of a wine during ageing. Researcher: Doug Adams. Funding: AVF, CCGPRVE.

$46,265: Improvement of grape and wine quality in the San Joaquin Valley. Researchers: Nick Dokoozlian, Bob Wample. Funding: AVF, CCGPRVE.

$44,930: Evaluation of training systems, trellises, row directions, and grape cultivars for dry-on-vine raisin production. Researcher: Matthew Fidelibus. Funding: VC.

$41,702: Interaction of irrigation amounts and canopy management practices on grapevine water relations, berry characteristics, productivity, and wine composition. Researcher: Larry Williams. Funding: VC.

$36,871: Vegetative aroma: Sensory definition, chemical interpretation (and ultimately) causal explanation. Researcher: Sue Ebeler. Funding: AVF, CCGPRVE.

$35,868: Comparison of irrigation management strategies to optimize wine grape productivity and fruit composition. Researcher: Larry Williams. Funding: AVF.

$35,600: Equipment grant — Capillary electrophoresis/mass spectrometer retrofit. Researcher: Andy Waterhouse. Funding: AVF.

$34,300: Influence of crop load management practices on grape and wine composition and quality. Researcher: Nick Dokoozlian. Funding: VC.

$33,430: Evaluation of Zinfandel Heritage Selections. Researcher: Jim Wolpert. Funding: AVF.

$31,934: Genetic diversity among brettanomyces isolated from wine. Researcher: Thomas Henick-Kling. Funding: AVF.

$30,272: Establishing critical values of N and K for grapevines. Researcher: Larry Williams Funding: VC.

$30,000: Development of molecular detection methodologies and characterization of a new virus associated with rootstock stem lesion. Researcher: Adib Rowhani. Funding: AVF, CCGPRVE, CTGC.

$26,566: Skin and seed tannin extraction during red wine fermentation. Researcher: James Kennedy. Funding: AVF.

$26,335: Spatial variation in soil chemical and physical properties and precision agriculture in two Carneros Pinot Noir vineyards. Researcher: David Smart. Funding: AVF.

Established in 1978 to raise funds for research in viticulture and enology, the AVF is a wine industry sponsored non-profit organization funded by growers and vintners. For more information regarding the AVF, visit www.avf.org, or contact Executive Director Patrick Gleeson, at 707/252-6911 or by e-mail at Patrick@AVF.ORG. ■

IN THE CELLAR by Jake Lorenzo

Jake Lorenzo meets Minister of Culture

Jake Lorenzo is on deadline. Normally, he'd have another two weeks to come up with something, but the family had plans to travel to Spain. Since Jakelyn's mother goes semi-hysterical whenever packing for a trip is necessary, this was probably not the most opportune time for her to experiment with lessening her estrogen dose. Jake discounts the occasional screams (and the thuds of objects hitting the walls) to her crazed, overwrought packing technique. It occurs to Jake that sitting in his office cranking out a column is good respite.

Our friends react to news of our travels with a mix of delight and resentment. "You dog, I'd love to go to Spain. You're always traveling. Didn't you just get back from Mexico?"

"No," Jake Lorenzo tells them. "We just returned from New Orleans. Mexico was the trip before that."

Most of Jake Lorenzo's friends think he has some outside source of income. It's not true, but Jake does know a secret. You see, most people work at a job to earn money to do the things they like to do, to buy the things they feel a need to own, and to travel in the style to which they are accustomed.

Jake's secret is that doing the things he likes to do *is his job*, which also includes eating good food, drinking good wine, and traveling whenever he gets the chance. Because Jake doesn't have a normal job, he has lots of time. He can go wherever he chooses, whenever an opportunity presents itself. Round trip ticket to Europe pops up for $450, and Jake Lorenzo grabs the passports, waits for Jakelyn's mom to have her packing breakdown, and we're out the door.

Let's say someone calls with free tickets to the Blues Festival in San Francisco. You'll soon find us packing a lunch, pouring our wine into plastic coke bottles, and sitting in our folding chairs listening to Blind Willie Somebody wail the blues.

Got an extra ticket to the Giants game? Jake Lorenzo brings both peanuts and sunflower seeds, and he'll buy the first round of beer.

Jake rarely *can't* get off work, and he has never used up all his vacation time. He may not have enough money to stay at a $200 per night hotel, but he has the time to find a decent place for $79. (Jake Lorenzo hates to spend more than $10 an hour to sleep.) Maybe he can't afford to dine at Restaurant Hot Stuff, but his detective background has trained him to ferret out inexpensive, delicious local joints wherever he may find myself.

Jakelyn's mother and Jake rarely go out to dinner, but he can manage his way around the stove well enough not to starve, and the wine cellar in Jake's house doesn't work on any mark-up.

Clearly, food, drink, and good company comprise a job worthy of any private eye. It's hard, but rewarding work. You never know when you will be challenged.

On the recent trip to Mexico we found ourselves in a car driving through the mountains outside Morelia on the way to an avocado farm. Did you know that 60% of the world's avocados are grown in the state of Michoacan, Mexico? (Stuff like that kills Jake Lorenzo.)

We walked from the avocado orchard, up the street, to a rustic wooden building with a rusty tin roof. We shuffled across the dirt floor, through the smoke wafting from the wood fire to a rough-hewn wooden table in the backyard. Chickens, pigs, cats, and dogs lazed around the yard.

We ordered homemade *chorizo*, *cecina* (a smoke-cured dried pork) *quesadillas*, *chiles rellenos*, and some of the best beans I've ever tasted. We washed the meal down with a few dozen beers, and some complimentary tequila from the restaurant owner.

The bill for eight of us came to $42, more or less the same price as a middle-of-the-road Chardonnay in a fancy California restaurant.

One of our hosts at that luncheon had just finished a 10-year stint as the Minister of Culture for the government of Mexico. He was a charming, entertaining man, and later that evening we sat around a roaring fire, sipping good tequila and talking about life.

As usual, the conversation turned to food. I think we were discussing avocados. From there we started talking about pigs, another big crop for the state. Naturally, the Mexican state raising the most pigs originated *carnitas*, the country's most famous pork dish. According to the Minister of Culture, *carnitas* came from Michoacan. Jalisco and Michoacan argue over who developed *birria*, and tacos definitely were invented in Mexico City.

"You know, it's strange," observed the Minister of Culture. "Most cultures have food spread over the world, but not the United States. Italians have pizza and spaghetti. Chinese food can be found in remote places in every country. French food is the technical standard for fine food in every major city. Japanese sushi is worldwide. Mexican tacos are everywhere. The French, Spanish, and Italians gave the world fine wine. Mexico has tequila. Russia has vodka, but what has the United States given the world — aside from McDonald's, that is?"

Ah, the Minister of Culture had a point, and it was aimed right at Jake Lorenzo's heart.

Here is Jake Lorenzo shivering a bit in the crisp night air, sipping some Pura Sangre Añejo, having to defend the homeland, and in Spanish yet. You think it's easy being a raconteur?

Jake told the Minister of Culture about the cacophony of flavor to be found in a perfectly spiced gumbo. He described the searing, mouth-cleansing flavor of green chile in New Mexico. He made the Minister of Culture hear the crackle of crisp fried chicken in Mississippi. He had his mouth watering for the clean salty brine of Puget Sound oysters.

"Señor Lorenzo," said the Minister of Culture, "I am sure that the United States has some wonderful foods. I do not doubt that. In fact, on many an occasion I have experienced such food. My question is about the contribution. What has the United States contributed to the world's culinary stockpile?"

Jake Lorenzo knows when he's being suckered. This man had tons of experience with these esoteric discussions. He had probably discussed artistic values on currency with Ministers of Finance, blabbed about work strategies with Ministers of Labor, debated fungicide application on avocado trees with Ministers of Agriculture. He was setting me up, in a good-natured way, to take a fall.

"Señor Minister," Jake said, "Italy, France, and Spain are thousands of years old. So are China and Japan. Mexico has more than four centuries under its belt. The United States is still a baby. Be patient. Give us some time. I guarantee that we will make our contribution to the culinary arts. In the meantime, you must come visit us in Sonoma. I will take you out for a hamburger that will make you weep. We'll have it with a bottle of California Zinfandel and some double-fried French fries, which were invented in Belgium, by the way."

The Minister of Culture laughed. He offered another glass of tequila. "You know what would be good, my friend?" he replied. "A nice juicy hamburger with some of those fresh Vidalia onions."

"That would be good," agreed Jake Lorenzo. "Probably won't happen here tonight."

"Probably not," consoled the Minister of Culture.

Jake Lorenzo reached over and clinked glasses with the Minister of Culture. "Guess we'll be seeing you in Sonoma, amigo." ■

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GusmerCellulo/ The Wine Lab merge

GusmerCellulo, a manufacturer and supplier of filtration, clarification, and processing materials for the beverage industry, recently took over operation of The Wine Lab™, a technical testing service for the grape and wine industry.

The Wine Lab has provided a wide range of grape and wine testing and interpretive services since its founding in 1975 by CEO Lisa Van de Water, who will remain as technical advisor while she pursues further consulting, teaching, and product development opportunities.

GusmerCellulo is finalizing a catalogue for the 2003 harvest and will continue to utilize the existing web site (thewinelab.com) and expand its content with more products previously available only through GusmerCellulo.

The laboratory service and technical support capabilities of The Wine Lab will continue in the same Napa, CA location and be complimented by GusmerCellulo products, technical specialists in the field, and the technical applications support group in Fresno, CA.

In Memoriam

Longtime stainless steel tank salesman Angus Shipley died May 17, 2003 at the age of 85. After a brief stint teaching food processing technology at the University of Connecticut in 1946, Shipley became a sales engineer two years later, an assignment that took him to many parts of the U.S. and the world. In 1974, he began work for the Paul Mueller Company selling stainless steel tanks to many wineries in California and Washington state. He retired from Mueller in 1992, but continued on as a consultant until 1996.

A memorial service was held in Falls Church, VA on June 21.

SMART VITICULTURE *by Dr. Richard Smart*

Remote sensing in vineyards

I recently took my graduate class from Cal Poly State University (San Luis Obispo, CA) to the San Luis Obispo Airport. Why an airport? Our class was to work with remote sensing in vineyards, and its applications to vineyard management. Our hosts were Airtime Aviation, which specializes in remote sensing, and Scan Control, which is responsible for "palm top management" (to be explained in detail below).

Aerial imaging of vineyards is not new. In fact, I used the method to survey vineyards with phylloxera in Gisborne, New Zealand during the early 1980s. It was then that I realized how immensely powerful it is to be able to see patterns in the vineyard. I quickly learned that an image by itself is not very useful. One must do the "ground truthing" as well. This means that you must be do ground inspection of the vines in order to understand what is causing differences in the image.

In the Gisborne survey we used infrared photographs. These photographs produce different colors for vines of different vigor. Thus we were able to detect vines showing a different color suffering from phylloxera. Armed with our aerial photographs, we would go into the field and accurately monitor vines in different stages of decline following phylloxera invasion. However, we never knew exactly where we were in the vineyards. This problem is now overcome using modern GPS technology.

New developments in remote sensing

Stephen Harrow is senior vice president with Airtime Aviation, a former Cal Poly soil science graduate, and also a winemaker. Steve explained to the class the modern methods of aerial imaging of vineyards. The plane is equipped with four cameras photographing in the red, green, blue, and near infrared zones. These cameras do not record on film but onto a computer hard drive as digital images. An important benefit of this technology: there is no degradation of images with further processing.

Cal Poly students visit Airtime Aviation

Differences in vine vigor can be detected by manipulating the ratios of red and near infrared light. The Normalized Difference Vegetation Index (NDVI) is such a ratio, and it is easily computed and mapped for a vineyard. The NDVI quite clearly shows plants which are under stress. Of course, it does not tell what sort of stress is affecting the vineyard. Such imaging can be done for less than $2 per acre for large vineyards.

The flight plan is developed using GPS before takeoff, with the cameras set to automatically begin recording when over the target zone. Images can be delivered to the clients within 48 hours. The plane's cameras can record an image every 13 seconds, each encompassing an area two miles by three miles in size at 25,000 ft. altitude. Our class saw use of NDVI to detect vigor differences due to soil type in Edna Valley and Santa Maria vineyards.

One problem with such images is that they can also show patterns in cover crops more than in vines, since when viewed from above the cover crop has a larger area than the top of the vine. Harrow overcomes this by doing imaging after mid-June, when the cover crop has typically died off. Flying at 12,000 feet altitude allows resolution to 1.0m. Satellite imagery can also be used, but resolution is not as good.

NDVI has been used in vineyards for the last decade. There is nothing new here. What is new is geo-referencing the image so that the locations of individual vines can be tracked. Of course, this depends on the altitude at which the plane is flown.

Use of aerial images pre-planting

Harrow has had experience with using aerial imaging in a pre-plant situation. If the soil is recently cultivated, the color of the topsoil can be a guide to future soil survey. Also, aerial infrared images of native vegetation or even field crops can detect differences in the field, which also can be a useful guide to soil sampling. The aim is to come up with vineyard "management units," areas with homogeneous properties that are managed identically. They will typically be under the control of one irrigation valve.

Contour maps can be created by field observations with differential GPS, accurate to less than 1.0 m. For example, one vineyard owner was concerned about the sunlight on hillside slopes facing in different directions and this could be calculated and mapped for him. Soil surveys are also geo-referenced, thus making mapping easier.

PDA computing

The part of this technology that was new to me was the application of PDA (Personal Digital Assistant) computing on a device you can hold in the palm of one hand. The technology was explained to us by Robin Wood of Scan Control. The instrument can be in the form of an organizer with black and white screen, or now a palm computer with a color

screen. These instruments can be connected to a GPS device that plugs on the back.

The image taken from the plane can be loaded into the palm computer. Remarkably, one can track one's position on this image while in the field using the palm device. It allows the operator to go to any part of the image to investigate what is causing differences. Observations that are geo-referenced can then be entered directly into the palm computer.

Wood explained how this technology can be applied. The palm device can be pre-programmed with questions for vineyard monitoring. The vigneron can locate his position in the vineyard with GPS, then begin recording answers to the questions. This data is stored in the device, and is transferred to a computer back in the office. Results can be mapped and stored in data bases. Applications include phenology measurements, pests, diseases, soil moisture, nutrient deficiencies, sugar levels, etc.

Common applications currently include observing differences in vine vigor due to moisture. Most readers will be aware of the effect of soil variation across a vineyard, and how some vines are more vigorous than others, even though all are given the same irrigation. Such patterns are clearly evident on an aerial infrared image.

There is an obvious need to locate vines with higher vigor, and to reduce water application. This can be done by changing drippers, and sometimes by installing valves. Imagine how much easier this is using a hand-held device with an aerial image of the vineyard, and your own location marked. Seeing the grouping of affected vines allows one to determine the best fix.

Terroir *unmasked?*

This new approach of combining aerial observation with mobile geo-referenced computing power allows the vigneron to intimately know every feature of the vineyard. Since important features will show up from the air (especially with near infrared), every source of variation can be investigated.

Nutrient effects can be tracked down by petiole and soil tests, and their location mapped. They can then be treated, area by area, without involving the whole vineyard. Similarly, as described above, soil effects on vigor can often be ironed out by altering the irrigation.

It is also significant that armed with a palm device and aerial map, one can guide labor crews during harvest to pick out any variability. *Such approaches will allow the vigneron to create more uniform vineyards, and thus promote wine quality.*

Conclusion

This technology is not expensive. A grower can arm himself with a black and white organizer, GPS receiver, and all

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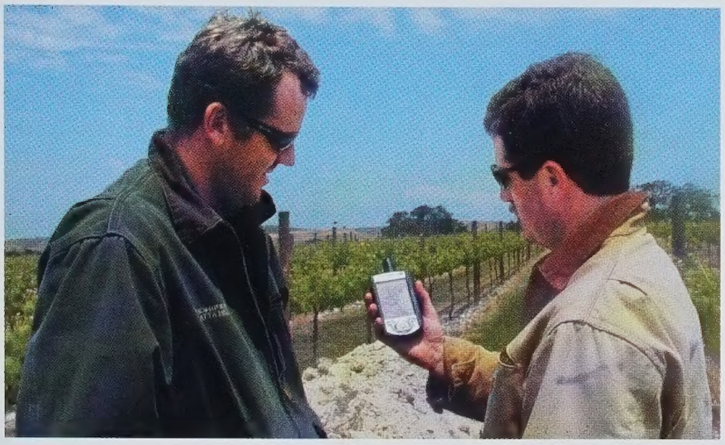

Steve Harrow (L) of Airtime Aviation and Simon Graves (R) of Southcorp Wines, Creston, CA, using the palm computer to check infra-red images.

necessary software for about $600, the color version costing a few hundred more. However, the possibilities to increase yield and to promote quality will be worth much more than this. Vignerons will have the opportunity to set up their own maps and data bases, so they will literally get to know their vineyards "like the palm of their hand." ■

Dr. Richard Smart, "the flying vine-doctor," is an international viticultural consultant based in Australia. Contact him by e-mail: vinedoctor@compuserve.com. Read about Dr. Smart's business, including his consulting schedule, educational wine tours, and seminars, at his home page, www.smartvit.com.au. He visits America frequently and his consulting schedule is arranged by Vinquiry in Windsor, CA, tel: 707/838-6312 and www.vinquiry.com

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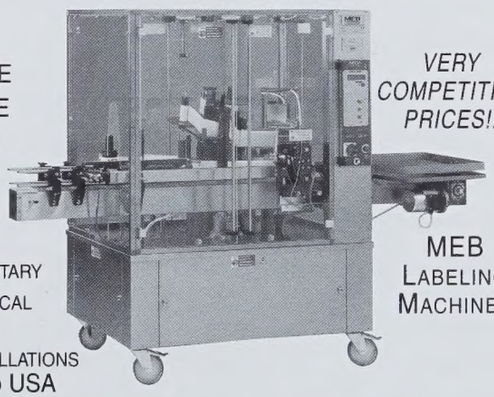

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Phenolic extraction

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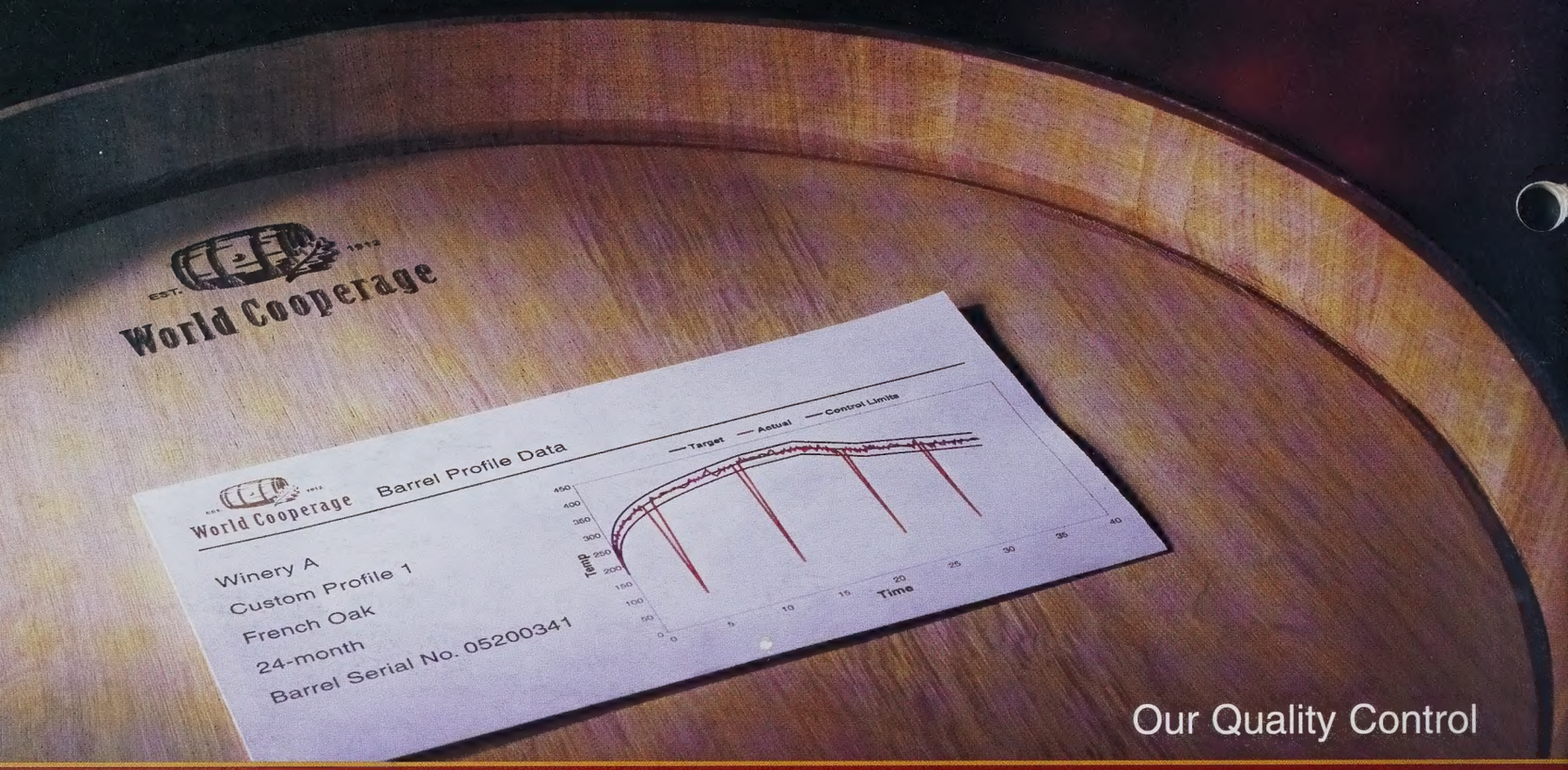

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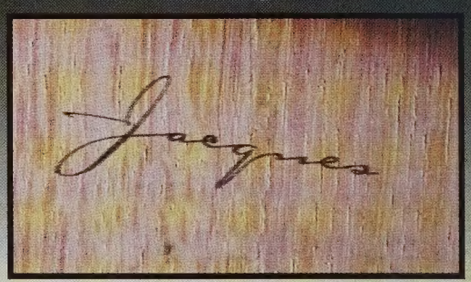
Their Quality Control



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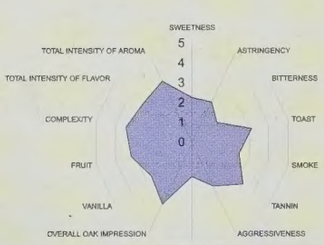
Sensory Profiles

Winery A Custom Profile 1



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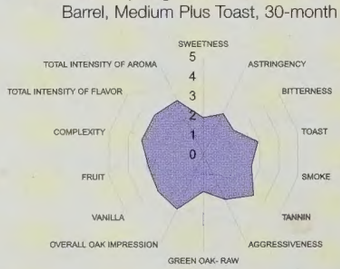

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